[redacted]

[redacted]

SPECIAL TEXT

ST 31-60-1

1950

RIVER CROSSING OPERATIONS

[redacted]

No person is entitled solely by virtue of his grade or position to knowledge or possession of classified matter. Such matter is entrusted only to those individuals whose official duties require such knowledge or possession. (See also AR 380-5.)

Prepared by

THE ENGINEER SCHOOL

The Engineer Center

Fort Belvoir, Virginia

This text is approved for resident and extension course instruction at The Engineer School only. It reflects the current thought of this school and conforms to printed Department of the Army doctrine as closely as possible.

[redacted]

Report Documentation Page

Form Approved
OMB No. 0704-0188

1. REPORT DATE	2. REPORT TYPE	3. DATES COVERED
1950	**N/A**	**-**

4. TITLE AND SUBTITLE	5a. CONTRACT NUMBER
River Crossing Operations	5b. GRANT NUMBER
	5c. PROGRAM ELEMENT NUMBER
6. AUTHOR(S)	5d. PROJECT NUMBER
	5e. TASK NUMBER
	5f. WORK UNIT NUMBER
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) **THE ENGINEER SCHOOL The Engineer Center Fort Belvoir, Virginia**	8. PERFORMING ORGANIZATION REPORT NUMBER
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)	10. SPONSOR/MONITOR'S ACRONYM(S)
	11. SPONSOR/MONITOR'S REPORT NUMBER(S)

12. DISTRIBUTION/AVAILABILITY STATEMENT
Approved for public release, distribution unlimited

13. SUPPLEMENTARY NOTES
JFSC - WW II Declassified Records.

14. ABSTRACT

15. SUBJECT TERMS

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT	b. ABSTRACT	c. THIS PAGE			
unclassified	**unclassified**	**unclassified**	**UU**	**119**	

Standard Form 298 (Rev. 8-98)
Prescribed by ANSI Std Z39-18

[redacted]

ENGINEER SCHOOL SPECIAL TEXT

ST 31-60-1

RIVER CROSSING OPERATIONS

1360

[redacted]

No person is entitled solely by virtue of his grade or position to knowledge or possession of classified matter. Such matter is entrusted only to those individuals whose official duties require such knowledge or possession. (See also AR 380-5.)

SEPTEMBER 1950

[redacted]

CONTENTS

c. Tactical courses of action are severely limited in a river crossing since deployment and fire power are restricted while troops and equipment are astride the river.

d. Technical problems of an engineering nature assume greater importance in a river-crossing operation since means must be provided to cross the water obstacle.

e. For development of crossing means see paragraph 121.

4. PURPOSE OF CROSSING

The purpose of a river crossing is to project troops and equipment across the river in sufficient numbers to insure steady movement in a decisive direction. Commanders and troops must think of a river as an obstacle to be overcome, not as an objective in itself.

Section III. KINDS OF CROSSINGS

5. GENERAL

There are two kinds of river crossings, hasty and deliberate. These may be further classified as to type; for example, a hasty crossing over a very wide river, or a deliberate crossing using special craft.

6. HASTY CROSSING

A hasty crossing is one of opportunity in which only the tactical and technical means immediately available to the unit making a crossing (ordinarily a division) are used. It is characterized by rapid seizure of a bridgehead with no delay for special training, no detailed planning by the unit staff, and no reinforcement by higher headquarters.

7. DELIBERATE CROSSING

A deliberate crossing is one in which additional personnel and equipment are required to reinforce the unit making the crossing. Corps or higher headquarters normally perform major planning and coordinating missions for this kind of operation, with lower echelons basing their plans on those developed by the higher echelon.

8. NORMAL CONSIDERATION

Every crossing operation should be conceived as a deliberate one. If troops reach the river and find they can cross without delay or reinforcement, the deliberate plans can be modified to meet the demands of a hasty crossing.

Section IV. OVERALL CONCEPTION

9. GENERAL

a. A river-crossing operation may be considered by the highest Army levels during peacetime. When our forces are sent to a theater of operations, any advance crossing information or plans are transferred to the commander of the theater concerned. It becomes his responsibility to develop the plans in accorance with the changes which may arise in the situation. To do this he assigns further development of the plans to his planning staff. Relying on long-range intelligence, the commander's staff keeps the plans up-to-date. When it appears likely a specific river is to be crossed, the plans are developed in as much detail as possible. All technical data about the river and its avenues of approach are assembled. The more completely the plans can be developed at this stage, the less planning effort will be required by lower planning levels when their forces approach the river to cross it. The plans must be so flexible, however, that later changes dictated by detailed reconnaissance and intelligence can be made without serious consequence.

b. When the theater commander announces his campaign plans to his major commands, work is started at various levels of command to vitalize the plans already in existence for specific river operations. At this stage tactical, technical, and logistical data, supplemented by the latest intelligence, are again studied. Troop and equipment allocations are tentatively established.

c. As the operation develops and plans become more firm, corps and higher headquarters issue warning orders to successively lower headquarters. Upon receipt of warning orders, these subordinate headquarters elaborate on the long-range plans of higher headquarters to include greater detail on items of particular interest to them. This period of planning is marked by a free exchange of information among all echelons. Each must keep in touch with all developments so all plans remain coordinated.

d. From long-range plans, the division or task force prepares a tentative plan to guide subordinate commanders in the course they are to pursue when they reach the river. Flexibility must characterize these plans.

e. During the advance to the river the tentative plans are studied by the commanders actually involved in the crossing. The availability and training status of the troops that are to make the initial crossing are reexamined, plans for the assembly and preparations for crossing are rechecked, and plans for the assault and advance on the far bank are resurveyed. All tactical, technical, and logistical matters are thus integrated into the final schemes, making the plans now current and detailed. Movement of troops and equipment into the attack positions starts the actual crossing operation.

f. Once started, the success of the crossing will depend on the thoroughness of prior arrangements and the commander's application of the principles of war—especially movement, mass, economy of force, security, and surprise.

10. BROAD ASPECTS

A crossing operation is generally viewed from three aspects: intelligence and reconnaissance, planning, and execution. These overlap to some degree but their use is convenient in discussing a crossing operation. They are delineated below.

a. Intelligence and reconnaissance. Includes:

(1) Long-range intelligence—information gathered and processed by higher echelon intelligence agencies.

(2) Detailed intelligence and reconnaissance—information resulting from ground and air reconnaissance.

b. Planning. Includes:

(1) Long-range planning, corps or higher level; also called advance planning.

(2) Short-range planning, division level; also known as outline planning.

(3) Current or detailed planning, by divisions and subordinate echelons directly involved in the crossing.

c. Execution. Includes actual operations, encompassing:

(1) Advance to the river.

(2) Assembly and preparation for crossing.

(3) The assault.

(4) Advance on the far bank.

11. PHASES OF OPERATION

In establishing a bridgehead in river crossings for a large force there are usually three successive phases—first, elimination of the enemy's capability to place effective direct fire on the crossing front; second, elimination of the enemy's capability to place observed artillery fires on the selected crossing sites; and third, elimination of the enemy's capability for placing any effective sustained fires of ground weapons on the selected crossing sites and on the space required on the enemy's side of the river for maneuver of the command. (See bridgehead objectives, par 29.)

Section V. COMMAND AND CONTROL

12. GENERAL

This section discusses command and control as related to a river-crossing operation and lists some detailed responsibilities.

13. CONCEPT OF COMMAND

a. As stated in FM 100-5, all the troops assigned to the execution of a distinct mission should be placed under one command, not only to insure the unified execution of the mission, but also to insure a single chain of command during the operation. A commander should not bypass other commanders in the chain of command except in emergency.

b. For a river-crossing operation, there is no departure from this doctrine. The commander who has a mission that requires him to cross a river, and who has the means by which he reasonably may be expected to achieve the crossing, commands the crossing. He may form the crossing forces into one or more task forces under his own control, or he may decentralize control to one or more subordinate tactical echelons of his command. His decision in this is based on the conditions that govern the effectiveness of his control, the amount of time available, and the availability of troops and materiel to support the crossing. When the commander requires special logistical and planning aid from higher headquarters, the command of the crossing operation normally passes upward to that higher headquarters.

14. ASSAULT CONTROL AND OVERALL CONTROL

A crossing is considered in terms of assault control and overall control. Assault control is the control exercised by the headquarters that commands the assault echelon. Assault control is ordinarily exercised by the division commander through his chain of command to the smallest unit. Overall control generally rests with the corps or higher commander, the exception being when the situation prevents him from exercising such control, as in a hasty crossing.

15. DELEGATION OF RESPONSIBILITIES

a. Responsibilities must be clearly defined and delineated to assure maximum success of the operation. The commander of a corps is likely to be commander of a deliberate crossing since corps controls

the necessary troops and equipment and is in a favorable position to have additional means made available as required. As it is physically impossible for the corps commander to control all elements of the assault force, he delegates responsibility for the accomplishment of the various tasks to selected individuals who know his desires. They act for the corps commander.

b. The commanders of the divisions are provided with whatever assistance is necessary and are assigned boundaries and objectives. After making these assignments, the corps commander normally allows each division commander maximum freedom and control in executing his mission as long as the corps mission is fulfilled. Additional assistance is made available to division commanders if needed. The corps commander relieves the division commander of routine responsibilities to the rear as quickly as possible by moving the corps forward boundary (division rear boundary) forward. The division commander, in turn, delegates responsibilities for tasks included in the division mission to his subordinate commanders and staff.

16. INTEGRITY OF UNITS

Integrity of units must be maintained, especially for this type of operation. The subordination of small units or parts of larger units to commanders unfamiliar with their capabilities and established methods of operation may jeopardize the success of the crossing.

17. DISSEMINATION OF COMMANDER'S INTENT

The complex nature of a crossing operation often contributes to a breakdown of the arrangements made for crossing the obstacle. The assault force may be suddenly confronted with the problems of: loss of stream-crossing equipment; adverse stream conditions caused by floods or floating debris; or nonavailability of proposed crossing sites resulting from developments in the tactical situation or enemy control of upstream stream-flow-regulating features. For these reasons, it is

essential that the intentions of the commander be clearly understood by everyone under his command so changes or improvisations can be made to allow the operation to progress.

18. DETAILED RESPONSIBILITIES

a. Intelligence and reconnaissance. The responsibility for intelligence and reconnaissance rests with all commanders participating in a river-crossing operation.

b. Planning. Commanders of all echelons are responsible for planning operations with which they are concerned.

c. Construction of bridges and rafts. When critical material must be committed or high-level coordination and control are required, the commander exercising overall control retains responsibility for raft and bridge construction. Otherwise, responsibility for the construction of rafts and prefabricated bridges is given the commander who exercises assault control. This authority may be further delegated to designated representatives or lower echelon commanders.

d. Near-bank defense. (1) The local defense of all ferry and bridge sites, concentration and assembly areas, vehicle parks, supply points, and equipment dumps in coordinated at corps or higher levels. A single commander is designated by corps to command the crossing site defense, including ground and air defense units. Some artillery is designated to support the defense of the crossing site in case of enemy counterattack. In general, each unit provides its own local security measures, but units of the reserve divisions may be employed in the ground defense plan for the near bank.

(2) An officer is appointed to supervise actual ground-defense arrangements at each ferry and bridge site. In emergencies, he may command all troops in the neighborhood except those belonging to major tactical units.

(3) An antiaircraft commander is appointed to control and coordinate antiaircraft defense of the river along the whole front of the attack and the near-bank installations.

e. Traffic. (1) Assault force rear line. The assault division commander is responsible for controlling and regulating all traffic forward of this line.

(2) Rear control line. The corps commander is responsible for controlling and regulating all traffic forward of this line.

f. Artillery and air support. Coordination of artillery and air support is the responsibility of the commander who excercises overall control of the operation.

g. Crossing areas. Initially the division commanders control the crossing areas. When the assault and follow-up echelons have crossed, control is passed on to corps.

h. Corps and army units. Since all units except divisions assigned to a corps are one-branch units, each is usually commanded by a designated officer of its own branch. For example, the corps engineer, though a staff officer, may be designated the commander of all engineer troops assigned or attached to his corps and not further detached. Corps or army units may be attached or placed in support of the assaulting divisions, depending on the command control and assistance needed by the division commander. Whenever a division is on an independent or distant mission, command control of supporting troops by the division commander is necessary.

i. Engineer support. The corps engineer is normally responsible for overall control of the engineers engaged in the crossing, less those engineers assigned or attached to divisions.

j. Movement of troops. Movement from attack positions to crossing points, embarkation, and crossing are responsibilities of the engineers and are coordinated through the commanders of infantry elements.

k. Reserve and reinforcing elements. All reserve and reinforcing elements of the corps main body remain under centralized control in rear areas until ordered by corps to cross.

l. Embarkation and landing. A crossing control officer is assigned to supervise the embarkation of the assault waves and the follow-up force at each crossing place. A landing officer, similarly assigned, controls activity on the far bank.

m. Fire plan. Division commanders prepare fire plans and maintain centralized control over supporting fires to provide support fires when and where needed. Centralized control may also be important from a surprise or secrecy standpoint since it is difficult for lower commanders to appreciate at what time surprise along the entire front has been lost.

n. Control of river after troops cross. When the majority of corps troops have crossed and operations are under way on the far side of the river, control of crossing means over the river passes from corps to army.

o. Dismantling corps bridges. Dismantling of corps bridges is a responsibility of army engineer troops. Only in emergencies do corps engineer troops return to bridge sites to recover equipment.

Chapter 2

BASIC CONSIDERATIONS

Section I. ENEMY DEFENSE OF RIVERS

19. GENERAL

This section discusses enemy defense of rivers. The next section deals with general problems of the attacker, including overall coordination, establishment of firm bridgehead, method of attack, time of crossing, training of troops, and miscellaneous.

20. METHODS OF DEFENSE

The defender holds a river in one of three ways:

a. He may use the river as a major obstacle for the main line of resistance, as a part of a position organized in depth along and in rear of the river (fig 1). In this method, screening forces are frequently employed across the river to delay and disorganize the attacker as he approaches. Such a position of defense requires a great many troops and considerable time, effort, and materials.

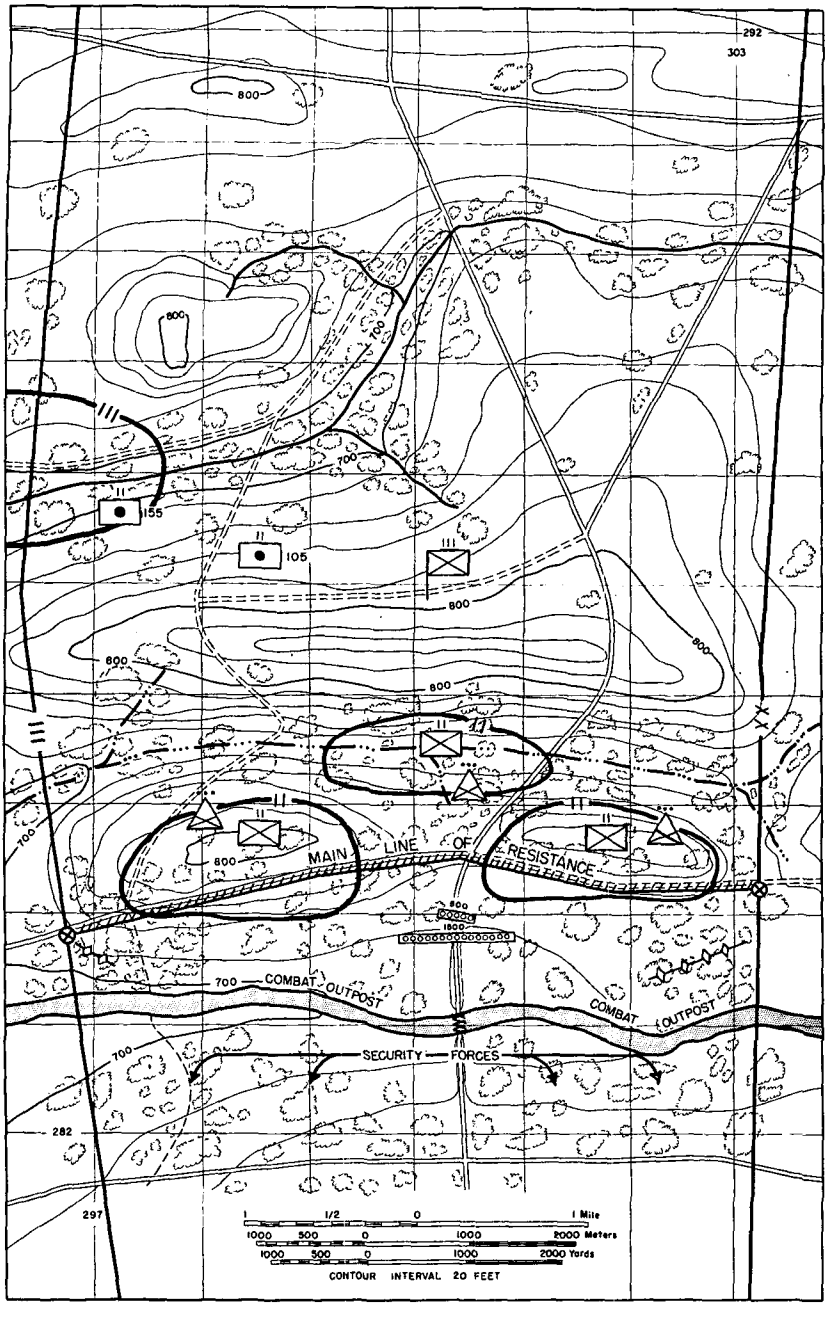

Figure 1. Defensive position using river as a major obstacle for main line of resistance.

b. He may defend the river with light security or screening units while holding the bulk of his forces mobile in the rear (fig 2). When an attack develops, the defender counterattacks the flanks of crossing forces with maximum strength. This type of defense calls for defensive-offensive action and is particularly suited for use when terrain is favorable and armor is available for counterattack.

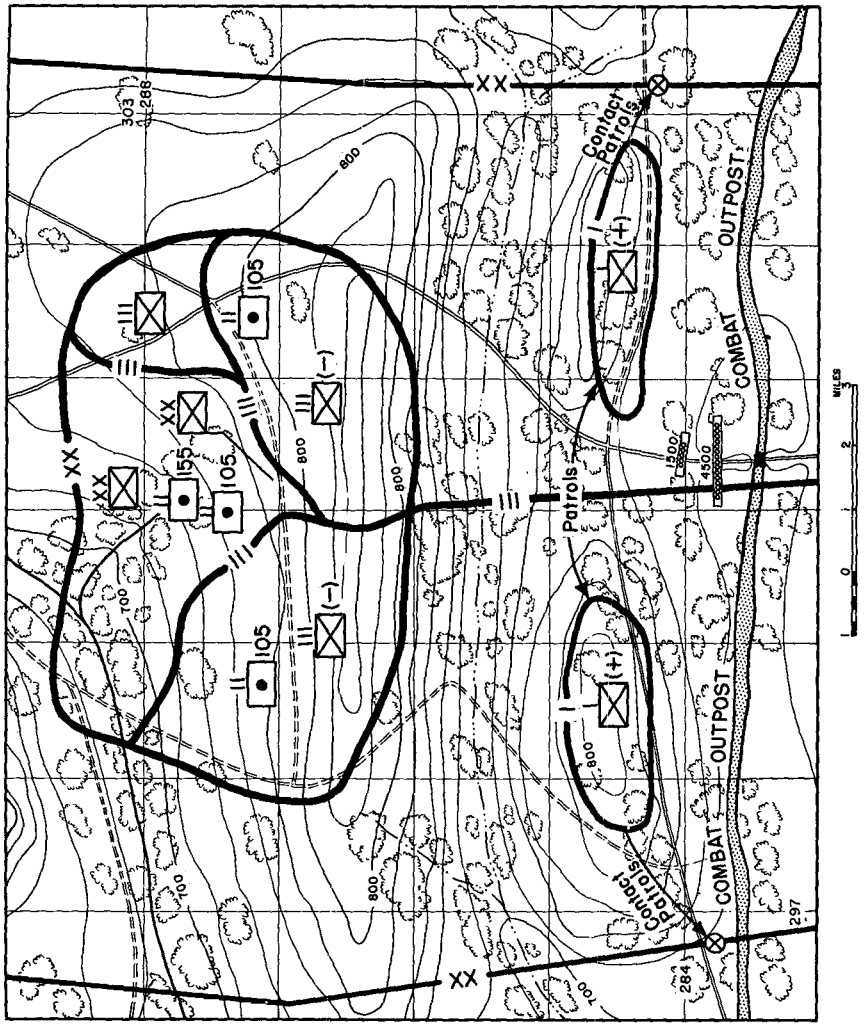

Figure 2. Defensive position organized for defensive-offensive action.

c. He may use a combination of a and b above.

21. PROBLEMS OF THE DEFENDER

a. Since the defender of a river does not possess the initiative, he must plan to meet river crossings at every conceivable point. This is made difficult by the following:

(1) In most cases unit sectors are wide and a deliberately organized position in depth requires more troops than are available.

(2) Extended frontages make communication difficult.

(3) Information as to the attacker's intentions may be meager. This is because of the difficulty in patrolling the far side of a river, and because the attacker usually carefully conceals the location of the primary crossing areas through the use of feints, demonstrations, and other deceptive measures.

(4) Signal communication lines, access routes, and supply operations are subject to interference from the attacker's fires.

(5) The attacker may attack under cover of darkness, with no preparatory fires, in an effort to achieve a surprise crossing.

b. When the attack comes, the defender analyzes the situation promptly to find out where the main effort is to be made. Discovering this early and accurately is the most difficult problem of the defense. Once he has made his decision, the defender launches his counterattack with all speed and power to eject the attacker before he can establish himself firmly.

c. The defender organizes and disposes his artillery to support the type of defense decided upon.

(1) In a position type of defense, the defender disposes his artillery in depth, capable of massing fires on critical points in the attacker's rear areas as well as on probable crossing sites. Of particular importance in this type of defense is the necessity for coordination to insure the withdrawal of the outpost artillery on the far bank, before the bridges are destroyed.

(2) In a defensive-offensive type of defense the defender disposes his direct support artillery to correspond to the mission and disposition of the defensive force which it is supporting. The rest of the supporting artillery is disposed to reinforce the direct support artillery and cover all probable crossing sites. When the attacker's main crossing is disclosed, the bulk of the general support artillery is displaced to previously prepared positions to support the counterattacking force.

(3) In the defensive-offensive type of defense, emphasis is placed on problems of maintenance of probable routes of displacement for artillery supporting the counterattacking force, traffic control, and preparation of fire plans and positions for possible counterattack areas.

Section II. PROBLEMS OF THE ATTACKER

22. OVERALL COORDINATION

The overall coordination and integration of efforts of the arms and services is a basic problem to the attacker owing to the intermingling in limited space of the many types of units involved. The problem is made more difficult by communication hindrances, the need for a deception scheme, the need for use of special equipment and special troops, and the time element involved. The problem is best solved by thorough planning and a behind-the-lines rehearsal of the operation.

23. ESTABLISHMENT OF FIRM BRIDGEHEAD

In establishing the bridgehead the chief danger is that troops in the early assault may become disorganized, particularly in darkness, while their units are astride the river. At that time, supporting weapons and units have not crossed; signal communication is limited to hand-carried communication means and amphibious vehicle radios; routes of movement are not cleared or marked; and command and control are loose.

This can be the most critical period of the operation. The buildup of forces in the bridgehead, reorganization if necessary, and the attack of successive objectives must proceed simultaneously and quickly if the crossing is to succeed. Coordinated attacks to seize the critical objectives must be carried out on schedule despite the limited communications, limited fire support, and limited number of vehicles available. After the seizure of objectives, the units must complete thier reorganization, consolidate the bridgehead area, and prepare to resume the offensive according to previously prepared plans.

24. ATTACK ON A BROAD OR NARROW FRONT

Whether to attack on a broad or narrow front is another problem of the attacking commander. A broad front is one having several or numerous points of attack; a narrow front, one having a single or relatively few points of attack. Attack on a narrow front may prove best in some instances, such as when access routes to the river are severely limited, but such a plan entails considerable risk. If the enemy correctly analyzes the attack, he can concentrate his forces, launch a determined counterattack, and place heavy fires on the critical crossing areas. On the other hand, an attack on a broad front disperses the enemy's defensive fires and delays the use of his mobile reserves. This is particularly true if the attacker makes a surprise crossing or deceives the enemy as to the location of his main effort. By the use, or apparent use, of numerous crossing sites, enemy weaknesses can be determined.

25. TIME OF CROSSING

a. General. Time of crossing is another basic problem of a river-crossing operation. Whether a crossing is made in daylight or darkness depends on: need for concealment, state of training of troops, nature of the terrain, characteristics of the water obstacle, enemy disposition and capabilities (such as use of mine fields on far bank; ability to make air and tank attacks), and need for speed. These factors are discussed below.

b. Factors influencing time of crossing. (1) Concealment. A crossing operation is best concealed from enemy fire and observation when it is carried out under cover of darkness. There must be enough light or visibility, however, for the assault elements to move up to and over the obstacle. A quarter moon behind the attacker provides about the best natural conditions of light for the assault, but there is no need to rely exclusively on the phases of the moon. On the darkest nights, use of artifical illumination (artificial moonlight) will enable the attacking force to marshal and start the assault, as well as build rafts and bridges under conditions of comparatively good visibility. A crossing made in daylight will be partly concealed if it is rainy, foggy, or misty or if some smoke is used.

(2) Inexperienced troops. A dawn or daylight crossing is usually preferable when inexperienced troops are to be used in the initial assault, because such troops may become disorganized and confused in darkness.

(3) Nature of terrain. Open terrain adjacent to the river makes easier the deployment of troops and equipment but offers little cover or concelament. On the other hand, close, wooded, and rough terrain impedes movement but affords cover and concelament. Thus, open terrain generally favors a night attack; close, wooded, or rough terrain, a daylight attack.

(4) Characteristics of river. Swift current in a wide stream, high banks, or tidal water with a mud bottom make a night crossing inadvisable.

(5) Enemy disposition and capabilities. Since the enemy's tank and air operations are limited by darkness, bridges can be constructed and used at night and be relatively safe from air and tank attack. Similarly, lanes through mine fields on the far bank are best cleared under cover of darkness.

(6) Speed. Greater speed is possible when the crossing is made in daylight, but this is gained at the direct expense of concealment and surprise. In a night crossing, capture of the first objective before morning twilight enables the assault force to exploit the bridgehead in daylight.

26. H-HOUR AND LINE OF DEPARTURE

For a deliberate assault river crossing, the near bank of the stream or a line forward of the attack position is normally considered to be the line of departure and H-hour the time when the assault troops cross the line of departure. For hasty crossings, the line of departure for the attack may be a considerable distance from the stream

27. DECEPTION

Deception is a vital problem of the attacker. Experience shows that the most effective crossings with the fewest number of casualties take place when the exact time and location of the crossing are a complete

surprise to the enemy. Surprise is achieved by speed, concealment, use of feints and demonstrations, careful timing, and signal communications security.

a. Concealment. Natural concealment and camouflage are desirable during assembly of troops and equipment and preparations for the crossing. Concealed assembly areas, supply points, and equipment and vehicle parks, are necessary to achieve surprise. Artillery and other fire support elements may occupy concealed positions before the crossing if this can be done without compromising security. Registration fire by these elements is kept at a minimum or may be prohibited for secrecy. When registration fire is employed, it should not be so localized that it will give away the planned crossing site. Concealed locations for all the activities are selected as far back from the river as possible, consistent with the mission and time required to move the troops and equipment to the river before H-hour. All troops, equipment, supplies, and vehicles are ordinarily moved into and out of the concealment areas under the cover of darkness. There should be a minimum of activity in these areas during daylight. Ordinarily the bulk of the fire support elements move into positions during the night before the crossing. It may be practicable to screen the preparatory work on the near bank by the large-scale use of smoke.

b. Feints and demonstrations. (1) Demonstrations all along the front will help keep the enemy from knowing the exact location of the actual crossing. Pneumatic targets, improvised dummies, sonic devices, smoke, and artillery fire may be used to increase the effectiveness of the demonstrations. If the operation is on such a large scale that there must be great activity at the selected crossing points on the near bank, the appearance of similar activity may be duplicated at other points along the river bank. All activity on the near bank and demonstrations on the river must be carefully timed to

cover the movement of troops and equipment, artillery registration, preparatory near-bank reconnaissance, and work for the actual crossing.

(2) Feints, properly carried out, disclose enemy troop dispositions. In a large-scale operation, it is feasible to time the feints to make the enemy commit his mobile reserve. This gains time in the critical period of reorganization on the far bank after the assault crossing. This time may be used to prepare against counterattack. Feints are so planned, timed, and executed that if the feinting troops gain a decided advantage, immediate steps may be taken to reinforce and exploit their success. Troops and equipment making a feint may thereafter not be available for use until the later phases of the crossing operation.

c. Timing. A coordinated timing schedule will aid the deception scheme.

d. Signal communications security. Signal communications should deviate as little as possible from normal. If radio has been used extensively for command and administrative traffic before the crossing operation, its use is continued during preparation and execution of the operation. Radio silence may be imposed from time to time for designated periods before the operation and then again during the operation. When the element of surprise is gone, radio traffic assumes normal characteristics. Signal communication plans for the operation should provide for the use of other means of communication while radio operation is restricted.

28. TRAINING

Special training of the infantry and engineer teams to be used in the initial assault is necessary for a successful crossing. Since this type of training is difficult to conceal, it is conducted well to the rear and preferably at night. This helps keep the enemy from learning the general crossing plan. The training area should be closed and the

identity of the units in training concealed. The training program should allow time both for movement of training equipment to training site and for training of instructors. To minimize losses and reduce tonnages to be moved forward on the days preceding the crossings, training should be accomplished with a minimum allowance of equipment. A final rehearsal should cap the training program. Specific items that should be covered in training include:

a. The training of infantry assault elements in the use of assault boats, along with the engineers who are to accompany them.

b. The training of all foot elements in the use of footbridges.

c. Training of troops in the use and construction of improvised crossing means.

29. BRIDGEHEAD OBJECTIVES

The attacker considers the assault of a river in terms of three terrain objectives which are defined below. The selection of these objectives, an important problem to the attacker, is discussed in paragraph 88. Local air superiority is a prerequisite to the taking of any of these objectives. Fire from ground weapons should be used to combat the use by the enemy of light observation aircraft. (See fig 3.)

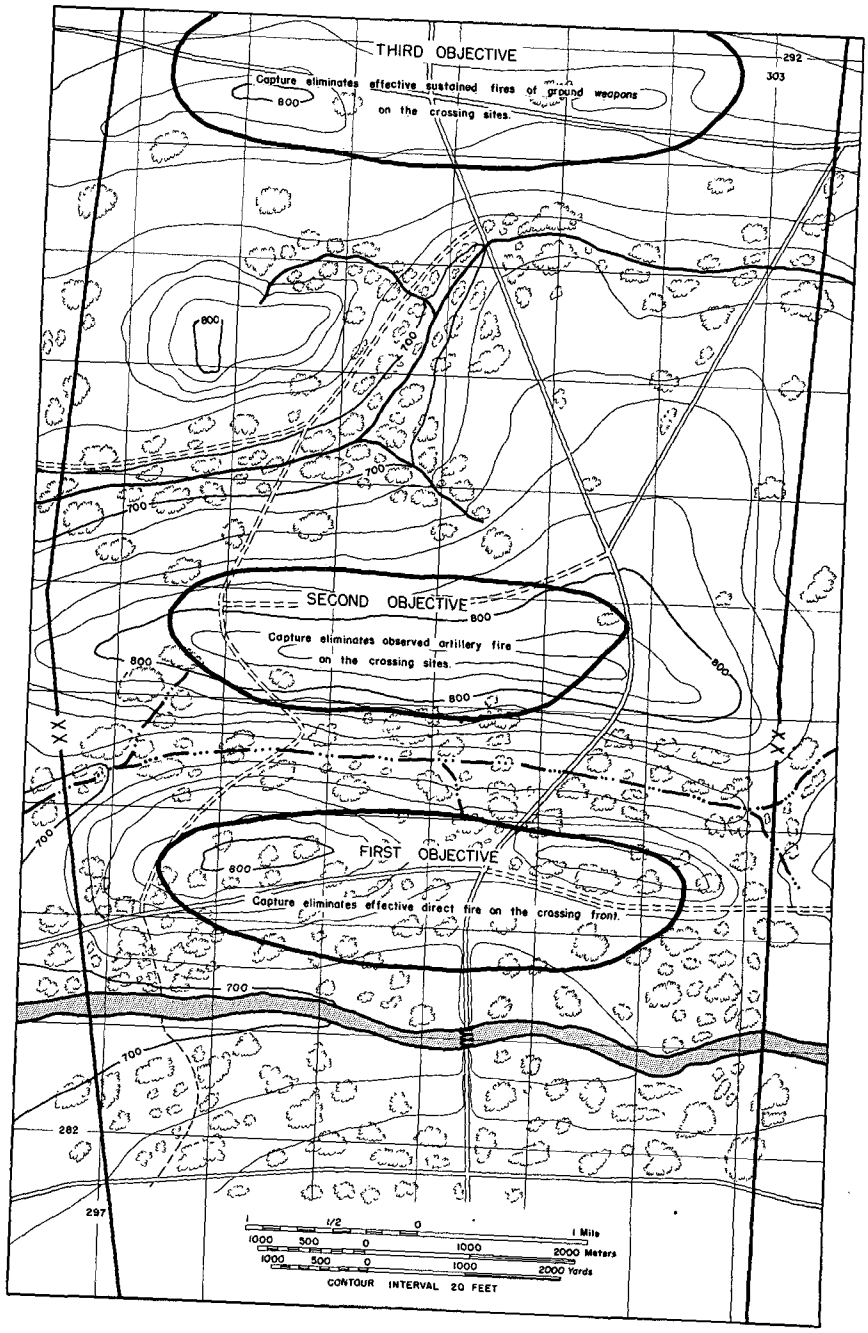

Figure 3. Bridgehead objectives.

a. First objective. The first objective is a position that will eliminate the enemy's effective direct fire on the crossing front. Attainment of this objective by troops in the initial assault waves makes easier the crossing of succeeding troops by assault and storm boats, footbridges, and rafts.

b. Second objective. The second objective is a position that will eliminate the enemy's observed artillery fires on the selected crossing sites. Attainment of this objective coupled with local air supremacy makes possible the construction of bridges to cross the heavier loads.

c. Third objective. The third objective is a position that eliminates the enemy's effective sustained fires of ground weapons on the selected crossing sites and on the space required on the enemy's side of the river for maneuver of the command. Attainment of this objective coupled with air supremacy allows uninterrupted use of all crossing means over the river, provides maneuver space for the command, and permits the establishment of supply points on the far side of the river.

Chapter 3

CROSSING EQUIPMENT

Section I. DESCRIPTION

30. GENERAL

Standard crossing equipment includes assault boats, rafts (light and heavy ferries), footbridges, and other bridges. These may be supplemented at times by special equipment such as storm boats, amphibious vehicles, and special craft. The use of the above equipment depends on its availability, characteristics of the river, availability of operating personnel, and security provisions. Portable and nonportable fixed bridges may be used to meet certain special requirements but are generally not used extensively in the early phases of an operation.

31. ASSAULT BOATS

a. Assault boat M2. The assault boat M2 will carry 12 infantrymen with full pack in addition to its crew of 3 engineers. The boat weighs 410 pounds and has a useful displacement of 4000 pounds. Seven of these boats can be transported nested on a 2½-ton truck or a 2-wheel trailer. Two assault boats fastened together stern-to-stern and powered by a 22-horsepower motor can carry a crew of 2 plus 22 infantrymen in currents up to 7 fps. In currents of 7 to 9 fps, the load limit is 2 crewmen and 15 infantrymen. See table I.

TABLE I. Assault and storm boats

1	2	3	4	5	6	7
River crossing means	Construction party (Engineers)	Maximum loads	Maximum stream velocity	Time in min for round trip across stream with width of:		
				300 feet	500 feet	1000 feet
SMALL BOATS:						
Assault boat M2: Single boat 9 paddles	Engineer crew-- 3 men	12 riflemen with Ind Equip or any of the following (in addition to crew): 1 rifle Sqd 1 Hv MG Sqd w/gun and 13 boxes Am 1 81-mm mortar Sqd w/mortar and 50 rounds Am 2 LMG Sqds w/guns and 20 boxes Am 2 60-mm mortar Sqds w/mortars and 72 rounds Am 1 75-mm rifle squad w/rifle and 70 rounds Am 1 57-mm rifle squad w/rifle and 100 rounds Am	4 fps	4	6	10
Two-boat ponton with 22-hp outboard motor	Engineer crew-- 2 men	22 passengers (in addition to crew) 15 passengers (in addition to crew)	7 fps 9 fps	-	4	6
Storm boat	Engineer crew-- 2 men	7 passengers or any of the following (in addition to crew): 7 riflemen 1 Hv MG Sqd w/gun and 9 boxes Am 1 81-mm mortar Sqd w/mortar and 24 rounds Am 1 LMG Sqd, 2 extra men, gun and 10 boxes Am 1 60-mm mortar Sqd, 2 extra men, gun and 36 rounds Am	11 fps	-	3	4

b. Storm boats. The storm boat is used most advantageously for crossing wide rivers (over 500 feet) or where secrecy is subordinate to speed. The boat carries a crew of two, plus seven infantrymen. It weighs 450 pounds, has a useful displacement of 2000 pounds, and is powered by a four-cylinder, two-cycle, 55-horsepower outboard motor which weighs 200 pounds. The boat has a speed of 20 to 28 miles per hour, depending on the load. Four boats can be transported on a two-wheel pole type trailer. Motors are transported in the bed of the prime mover. Storm boats and motors are class IV items. See table I.

c. Reconnaissance boats. There are two sizes of pneumatic reconnaissance boats, two-man and 5-man sizes.

32. RAFTS

a. General. See figures 4, 5, and 7. For types, use, and characteristics of rafts, see table II.

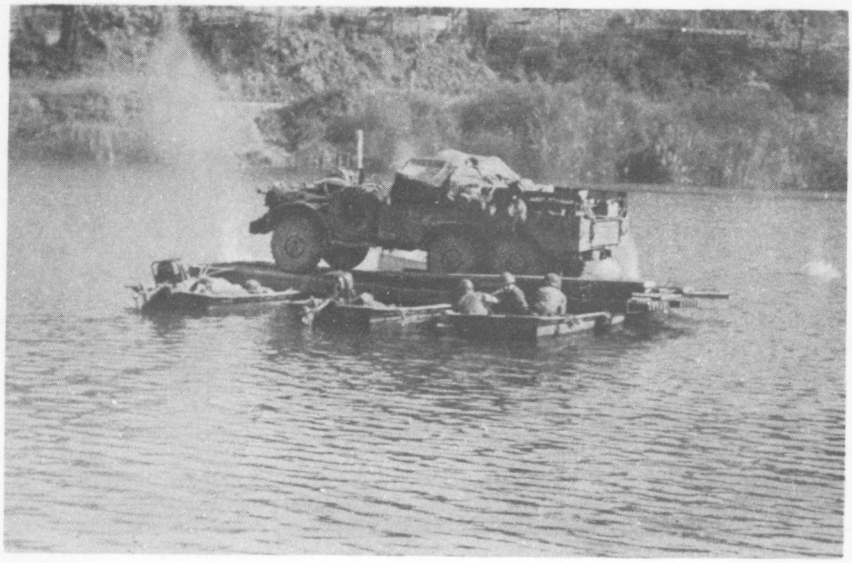

Figure 4. Infantry support raft.

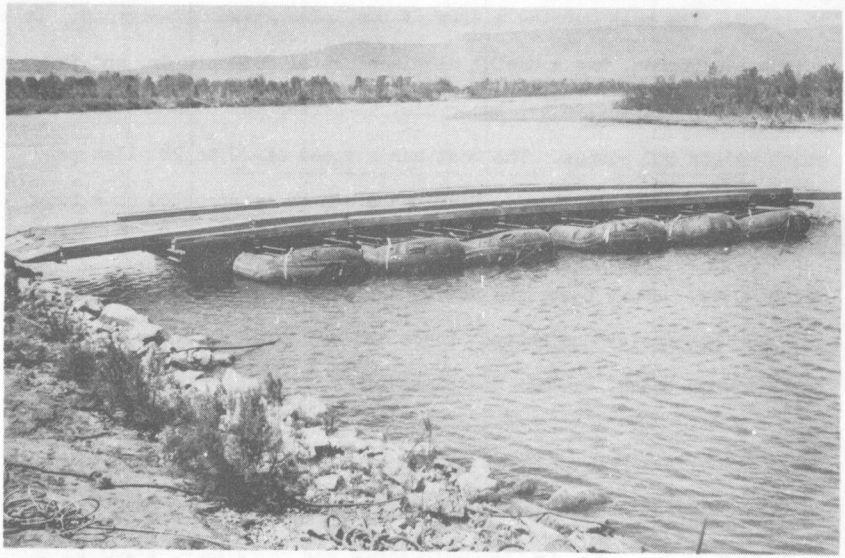

Figure 5. Six float raft (airborne equipage).

Figure 6. M4 raft.

TABLE II. Rafts

Means (1)	Transportation required (2)	Construction time (3)	Construction party (4)	Operating crew (5)	Loads (6)	Maximum stream velocity (7)	Round trips per hour for stream width of 300 ft (8)	500 ft (9)	1000 ft (10)
Infantry support raft									
5 ponton 36-foot	1 2½T truck and 1 pole trl	10 min	1 plat	1 NCO 10 EM	Truck 2½T - 8T	6 fps	5	3	2
5 ponton 48-foot	2 2½T truck and 2 pole trl	15 min	1 plat	1 NCO 10 EM	Truck 4T, truck 2½T with 105-mm how, grader - 13T	4 fps	5	3	2
7 ponton 60-foot	2 2½T truck and 2 pole trl	20 min	1 plat	1 NCO 10 EM	Truck 4T and truck 2½T - 21T	3 fps	5	3	2
Treadway ferry 60-foot	3 6T treadway trucks	½ hr	1 NCO 16 EM	1 NCO 10 EM	Medium tank - 46T	7 fps	5	3	2
M4 raft									
4 ponton 82-foot	5 2½T trucks modified	1 hr	1 plat	1 NCO 10 EM	Medium tank - 55T	9 fps	5	3	2
6 ponton 82-foot	6 2½T trucks modified	1 hr	1 plat	1 NCO 10 EM	70T tank load - 80T	9 fps	5	3	2
7 ponton 82-foot	7 2½T trucks modified	1 hr	1 plat	1 NCO 10 EM	80T tank load - 90T	9 fps	5	3	2
Airborne pneumatic float									
4 float 82-foot	6 4T LWB trucks	1 hr	1 plat	1 NCO 10 EM	Medium tank M4 - 35T	6 fps	5	3	2
6 float 82-foot	9 4T LWB trucks	1½ hr	1 plat	1 NCO 10 EM	50T tank load - 55T	4 fps	5	3	2

Notes:

1. Length given is overall length of raft including overhanging end sections.

2. Transportation required includes only that transportation necessary to carry the rafting equipment. Extra transportation must be supplied to carry troops and construction equipment.

3. Construction time is from arrival of equipment at site and includes unloading and construction in daylight by trained troops. It does not include time for preparing landing site, landing stage, or approach roads.

4. Allowance must be made for specific site conditions and state of training of troops in rafting.

5. This includes normal maintenance and operation.

6. Underlined figures represent safe gross tonnage. Loads must conform to length and tonnage of raft. See appropriate manual for capacities at higher velocities.

7. In currents above 4 fps, loads are placed on downstream side of deck.

8, 9, 10. Round trip time assumes daylight, men fully trained in rafting, favorable site for loading and unloading, and current of 5 fps. Rafting is slower if a landing stage is required or if source of power cannot produce maximum speed. Increase time 100% if men are not fully trained in rafting. Two rafts can be used efficiently at one site if river is over 250 feet wide; three, if river is over 500 feet wide.

NOTES -- (Continued)

b. Advantages. Under favorable conditions, rafts provide a limited number of vehicles with an early means of crossing. Because of their mobility, rafts are not particularly vulnerable to artillery attack. When enemy action interferes with their use, the rafts can be moved easily to new operating locations if approach and exit roads are available or can be easily constructed.

c. Disadvantages. The use of rafts is limited by the depth and currents of the river, and the nature of the banks. Trained crews must be provided to operate them.

33. FOOTBRIDGES

Footbridges are a standard means of crossing foot troops. Their use allows units to cross more nearly intact as units. Not materially affected by small-arms fire, they also present meager targets to enemy aircraft. They cannot be safely used in currents over 7 feet per second (fps) and troop flow must be regulated to keep the bridges from capsizing. One unit of footbridge equipment, 432 feet long, requires three 2½-ton trucks to transport it. See table III.

TABLE III. Bridges

Means (*1)	Transportation required (*2)	Construction time Hours for stream width: 150 ft	250 ft	500 ft (*3)	1000 ft	Construction party (*4)	Posted capacity (tons) stream velocity of: 3 fps	5 fps	7 fps (*5)	9 fps	11 fps	Maintenance crew (*6)	Traffic capacity-Vehicular distance (*7)
Footbridge M1938	1 2½T Truck per 144 ft of bridge	1/4	1/3	1/2	--	1 plat	--	--	--	--	--	1 NCO 2 EM	Day: 75 men per minute; night: 40 men per minute at normal 2-pace distance
M2 Assault Boat Bridge (Note 8)	1 2½T Truck and 1 Pole Type Trl per 36 ft of bridge	1	1½	2½	--	1 plat	8	6	5	--	--	1 NCO 12 EM	200 vehicles per hour 90-ft distance between vehicles
Reinforced (Note 8)	1 2½T Truck and 1 Pole Type Trl per 24 ft of bridge	1½	2	3	--	1 plat	13	9	7	--	--	1 NCO 12 EM	200 vehicles per hour 90-ft distance between vehicles
Steel Treadway Bridge Widened (Note 8)	1 6T Treadway Truck per 24 ft of bridge	3	6	8	16	1 Tdwy Br Co plus 1 Combat Co	50	50	45	25	--	1 NCO 12 EM	400 vehicles per hour 90-ft distance between vehicles
M4 Floating Bridge	1 2½T LWB Truck (modified) per 15 ft of bridge	4½	7½	12	24	1 Ponton Br Co plus 1 or 2 Combat Cos (*9)	55/95	55/95	55/95	45/75	30/40	1 NCO 12 EM	400 vehicles per hour 90-ft distance between vehicles
							normal/reinforced						
Floating Bridge, 50T Airborne	1 4T LWB Truck per 15 ft of normal bridge	6	12	--	--	1 Br Plat plus 1 Combat Co	45	35	30	10	--	1 NCO 12 EM	400 vehicles per hour 90-ft distance between vehicles

* Notes: 1. Bridges listed are standard.

2. Transportation listed includes only that necessary for bridging equipment. Additional transportation must be furnished for troops and construction equipment.

3. Time is from arrival of equipment on site and includes unloading and construction in daylight. It does not include time for preparing approach roads, assembly sites, and abutments, and for installing anchorage.

4. Allowances must be made for specific site conditions and state of training of troops. Figures given are average for trained troops and continuous daylight construction.

5. Feet per second is expressed fps. See FM 5-10 for explanation of meaning and use of posted capacities, description of system of bridge and vehicle classification, and charts giving conditions under which specific vehicles can cross standard bridges. When the tactical situation demands and when the bridging troops are well trained and have good watermanship in rapidly flowing streams, the tabulated velocities may be exceeded on the tactical commanders decision (except for footbridges).

6. This includes only normal maintenance of the bridge proper.

7. Traffic capacity is for daylight (see note 9). Vehicular distance is for vehicles greater than 60% of posted capacity pass unrestricted as to distance. Capacity is for one-way traffic only. Where two-way traffic must be carried on one-lane bridge, capacity in either direction is one-half that shown.

8. Bridges, M2 assault boat, are restricted to certain vehicles because of side-to-side gap between runways.

9. Construction party: 1 combat company per 250 ft of bridge--not to exceed 1 combat battalion.

34. FLOATING BRIDGES

a. General. See table III.

b. M2 assault boat bridge. The assault boat bridge is an expedient bridge which unreinforced can carry loads up to 8 tons. By reinforcing it with pontons, the capacity of the bridge may be increased to 13 tons in a current not exceeding 3 feet per second. The bridge should not be left in continuous use because its light construction will not withstand the rigors of continuous traffic. It is constructed from infantry-support equipage. Approximately 190 feet of bridge can be built from the materials of six three-ponton infantry support rafts.

c. Floating bridge, steel treadway (widened). The steel treadway bridge (widened) (fig 7) consists of pneumatic floats supporting steel treadways joined end-to-end to form two continuous tracks. When stream, bed, or bank conditions prevent the use of floats, the steel treadways are supported on 25-ton trestles. The M2 bridge uses 18-ton pneumatic floats and 12-foot-long, 45½-inch-wide treadways. One unit of M2 bridge is 288 feet long.

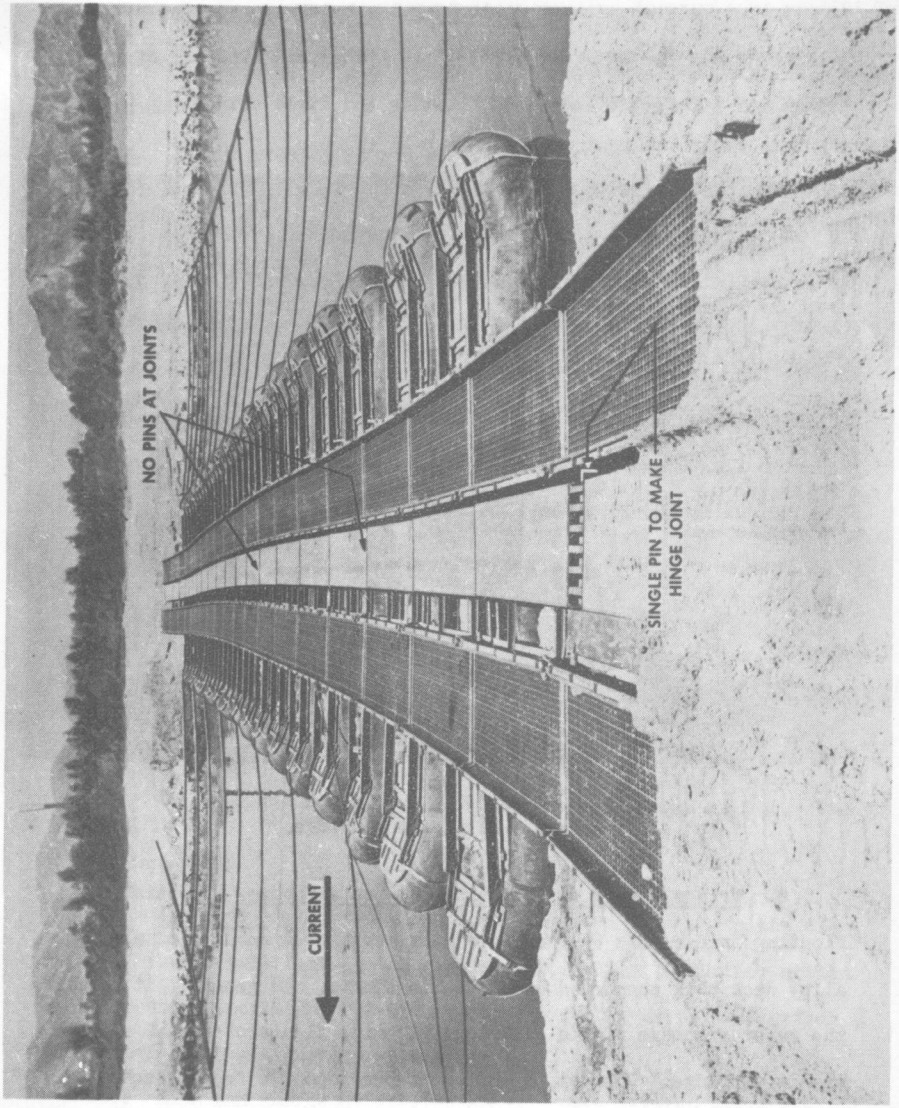

Figure 7. Floating bridge, steel treadway (widened).

d. M4 floating bridge. The floating bridge M4 (fig 8) consists of a continuous roadway of aluminum-alloy deck balk supported by aluminum pontons. Shore connections are made by resting the end balk upon abutment sills on the banks or by using one or more trestle spans. Balk are pinned to removable ponton gunwales, permitting pontons to be replaced without disturbing the bridge deck. One set of equipment provides 428 feet of floating bridge and 195 feet of fixed bridge, or 608 feet of combined floating and fixed bridge.

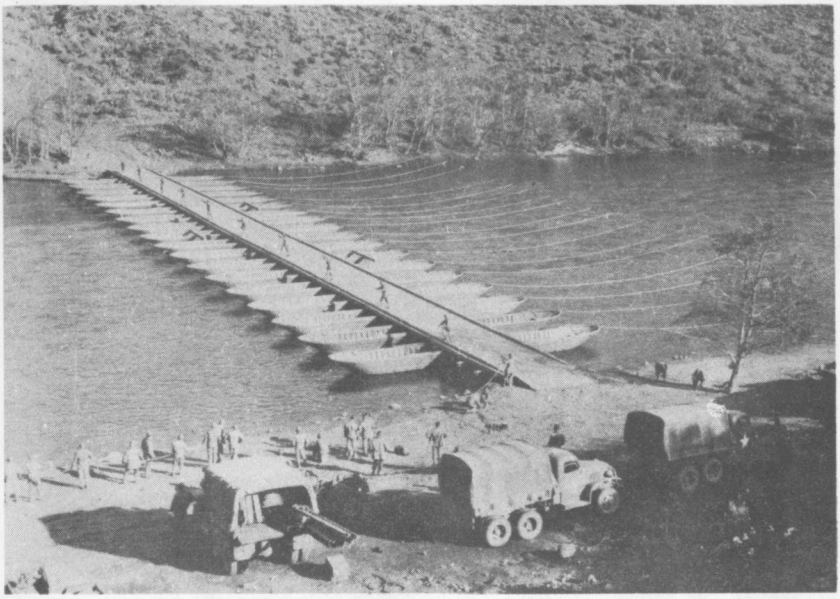

Figure 8. M4 floating bridge.

e. Bridge, fixed or floating, 50-ton airborne. The airborne floating bridge (fig 9) consists of a continuous roadway of aluminum-alloy deck balk supported by pneumatic floats. In general, it combines the superstructure of the M4 bridge with the floats of the M2 steel treadway bridge. One set of equipment provides 276 feet 8 inches of combined fixed and floating bridge.

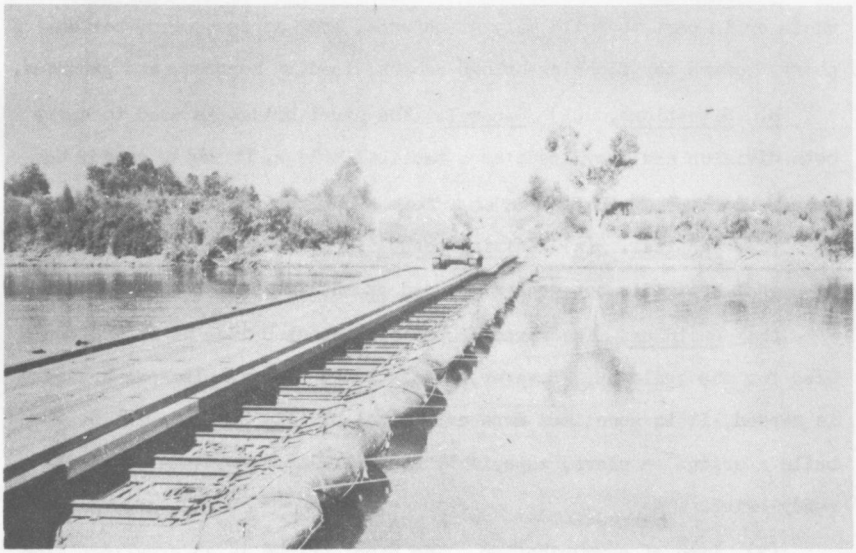

Figure 9. Airborne bridge.

35. PANEL BRIDGE, BAILY TYPE, M2 (See TM 5-277)

a. Types of structure. (1) General. Panel bridge equipment can be used to build fixed bridges and panel crib piers and towers. Other specail structures such as suspension bridges, retractable bridges, and mobile bridges, can be built using special parts.

(2) Normal construction. Panel bridge equipment is normally used to erect fixed simple-span single lane through type bridges from 30 to 210 feet long. The bridge can be assembled to meet varying conditions of span and load.

(3) Special construction. (a) Bridges. Panel bridge equipment can also be used to build two-lane through type bridges, single lane or two lane deck type bridges, railway bridges, and bridges on piers.

(b) Piers. Panel crib piers and towers up to 70 feet high can be built with panel bridge equipment and special crib-pier parts.

(c) Expedients. Panel bridge equipment can also be used in whole or in part to build many structures, such as causeways, box anchors, towers for floating-bridge cables, loading hoppers, and gantries.

b. Situations. (1) General. The panel bridge is used to carry both division and army loads as a tactical bridge. It may be used in the assault and in the build-up, or as a line of communication bridge.

(2) Tactical. (a) Initial assault. For the initial assault the panel bridge is not generally used except in special situations.

(b) Build-up. The fixed simple-span panel bridge is most often used for the build-up. However, when a long, simple-span bridge is needed, it is sometimes more economical of time and material to build a bridge on piers, especially if partially demolished piers already exist.

(3) Line of communication. The panel bridge is an excellent line of communication bridge. It can be built as a through type bridge, and as a fixed deck type bridge.

36. AMPHIBIOUS VEHICLES

a. Types. Common types of amphibious vehicles are:

(1) Landing Vehicle, Tracked Mk 4.

(2) DUKWS—2½-ton, 6 x 6, amphibious trucks.

(3) Weasels—cargo carrier M29C.

b. Limitations. Amphibious vehicles require landing places of a suitable gentle gradient, and with a firm bottom for entering or leaving the water. The landing places must be wide enough to allow amphibious vehicles to land even though subjected to the lateral force of the stream current. Amphibious vehicles can be preloaded and do not require a multiplicity of operations such as carrying and launching, but their use depends on availability of suitable entrances and exits to and from the river and on moderate stream currents. Their noise of operation may limit their use in the early phase of the attack.

c. Technical characteristics. See table IV.

TABLE IV. Amphibious vehicles and landing craft

1	2	3	4	5	6	7	8
Type	Capacity	Length	Beam	Draft	Displacement	Speed (knots)	Endurance (miles)
LCM (3) Landing craft mechanized (mark 3)	80-120 troops or 1 30-ton tank or other large vehicle or 60,000 lbs cargo	50 ft	14 ft 1 in	3 ft forward 4 ft aft, loaded	26 tons, light	11 maximum 8 loaded	850 at 6½ knots 150 at 11 knots
LCM (6) Landing craft mechanized (mark 6)	80-120 troops or 1 34-ton tank or other large vehicle or 68,000 lbs cargo	56 ft	14 ft 1 in	3 ft forward 4 ft aft, loaded	26 tons, light	11 maximum 8 loaded	850 at 6½ knots 150 at 11 knots
LCVP Landing craft vehicle, personnel	36 troops, one 3/4-ton truck, or 8100 lbs cargo	36 ft 9 in	10 ft 11⅛ in	2 ft 2 in forward 3 ft aft, loaded	8.4 tons, light	9 maximum	105 at 9 knots
LVT (4) Landing vehicle tracked (mark 4)	30 troops 8000 lbs cargo	26 ft 1 in	10 ft 8 in	4 ft 6 in loaded	10.5 tons, light	5.5 in water 15 mph on land	75 in water 150 on land
DUKW 2½-ton, 6 x 6 amphibious truck	25 troops, 12 litters, or 5000 lbs cargo	31 ft	8 ft	4 ft 3 in loaded	6 tons, light	5.5 in water 50 mph on land	30 in water 400 on land
Weasel, cargo carrier M29C	4 men and gear, or 2 men and 1200 lbs cargo	15 ft 9 in	5 ft 11 in	Data not available	2.6 tons, light	3 to 4 in water 25 mph on land	80 in water 125 on land

37. LANDING CRAFT

a. Types. Landing craft which may be used in a river crossing include:

(1) Landing craft mechanized, mark 3 (LCM'S).

(2) Landing craft mechanized, mark 6.

(3) Landing craft vehicle, personnel (LCVP's).

b. Technical characteristics. See table IV.

Section II. USE

38. GENERAL

Standard crossing equipment can be used on nearly all streams. Consideration should be given, however, to the maximum safe stream velocity for each type of equipment. For convenience in planning, streams are grouped as follows: those up to 250 feet wide, those 250 to 500 feet wide, and those over 500 feet wide.

39. STREAMS UP TO 250 FEET WIDE

Standard crossing equipment carried by bridge platoon is sufficient for crossing streams up to 250 feet wide. Normally, only one raft can be efficiently operated at each site on streams in this group.

40. STREAMS 250 TO 500 FEET WIDE

Standard crossing equipment carried by a bridge company is sufficient for streams 250 to 500 feet wide. Two rafts can be efficiently operated at each site on these streams.

41. STREAMS OVER 500 FEET WIDE

Standard crossing equipment, plus powered craft, is used for streams over 500 feet wide. Ordinarily three rafts can be efficiently operated at each site on such streams.

Section III. SITE REQUIREMENTS FOR CROSSING BY RAFTS AND FLOATING BRIDGES

42. RAFTS

A raft site should have:

a. Short, easily constructed access roads from existing road net to site.

b. A gentle current near each bank. Location of site in a straight reach is desirable.

c. Stream water free from snags, rocks, shoals, and other obstructions that would prevent or hinder crossings.

d. Banks not so high or steep as to require excessive grading for approach. The water close to the bank should be deep enough to float a loaded raft without grounding.

e. Cover and concealment on both shores for vehicles or personnel waiting to be loaded or unloaded.

f. Covered routes of approach to the far-bank assembly areas.

43. FLOATING BRIDGES

Floating-bridge sites should have:

a. Road nets on both shores or near both shores.

b. Access roads requiring little preparation.

c. Banks firm enough to support the heaviest vehicles.

d. Stream current moderate and parallel to banks.

e. Stream free of snags, sand bars, and large rocks that might prevent or hinder crossings.

f. Stream bottoms in which anchors will hold but not foul.

g. Existing or easily prepared assembly sites on near shore.

Section IV. ALLOTMENT OF EQUIPMENT

44. GENERAL

For general distribution of floating equipment, see table V.

TABLE V. Distribution of floating equipment

1	Item	2 Engr C Bn Div	3 Armd Engr Bn	4 Abn Engr Bn	5 Engr Pon Br Co	6 Engr Tdy Br Co	7 Lt Equip Plat
2	Boat, assault, M2	21	42			14	70
3	Boat, rcn, pneu, 2-man	18	18				
4	Boat, rcn, pneu, 5-man			24			
5	Boat, utility, powered, 18-foot				1		
6	Boat, utility, powered, 25-foot	1	2	1	3	2	
7	Bridge, fixed and floating, 50-ton, airborne (276 ft 8 in)			1			
8	Bridge, floating, M4 (608 ft)				1		
9	Footbridge, M1938 (432 ft)						1
10	Ferry set No 1, infantry support						4
11	Raft, infantry support						12
12	Bridge, floating, treadway, steel, widened (288 ft)	1	2			3	

45. ASSAULT BOATS

Assault boats from the divisional engineer combat battalion and a supporting engineer combat group enable an infantry division to cross four rifle companies and two heavy weapons companies in a single trip. Reserve crossing boats must be secured from depot stocks. By crossing two infantry divisions abreast, corps can allocate one of the two engineer groups normally available to each of the assaulting infantry divisions (see table V).

46. HEAVY BRIDGING EQUIPMENT

Heavy bridging equipment normally remains under corps control. Engineer personnel normally available to corps is fully utilized in manning the equipment and performing engineer missions. If additional crossing equipment available from army is used, then additional engineer personnel necessary to man the equipment must also be secured by corps. The assault crossing and bridging equipment of the organic divisional battalion ordinarily should not be included in the equipment allocation. This equipment should be available to the division for far-bank short-gap operations (fig 10) and will undoubtedly be needed for the continuation of the advance on the far side of the river. This eliminates the necessity for the far-bank supporting engineers having to return to the river bank to recover the necessary equipment.

Figure 10. Short-gap fixed-bridge span.

Section V. HEAVY BRIDGES

47. RESPONSIBILITY FOR INITIATING CONSTRUCTION

See paragraph 18c.

48. FACTORS TO BE CONSIDERED IN ORDERING CONSTRUCTION

The following factors must be considered before heavy-bridge construction is ordered:

a. The corps mission.

b. The needs of the assault divisions on the far side of the river.

c. The amount of bridging available and the future bridging requirements.

d. The accuracy and intensity of enemy air attacks and artillery fire on the bridge site.

e. The probable number of casualties if armor cannot cross because bridges are not in.

f. The effect on operations if critical bridging is erected and then destroyed.

Chapter 4

GENERAL COMPOSITION, MISSION, AND EMPLOYMENT OF ASSAULT FORCE

Section I. COMPOSITION

49. GENERAL

The assault force may be considered as consisting of five basic echelons. These are the assault, fire support, engineer, follow-up, and rear echelons. This grouping is for discussion and functional convenience only; no command or operational control is implied. This chapter describes the composition and mission of these various echelons and discusses their general employment.

50. ASSAULT ECHELON

The composition of the assault echelon will vary with the tactical conditions encountered, but its general makeup will be as shown below. (Waves, boat groups, and boat teams are made up from these assault elements.)

a. Infantry riflemen and infantrymen with hand-carried infantry close-support weapons.

b. Engineer mine-clearing parties.

c. Engineer assault-boat teams and guides.

d. Tactical command sections.

e. Engineer units in close support of assaulting troops on the far bank.

f. Artillery forward observers.

g. Medical aid men.

h. Forward liaison parties of reserve troops.

i. Tactical air control parties.

51. FIRE SUPPORT ECHELON

The fire-support echelon is composed of the following units:

a. Heavy weapons companies of both assaulting and reserve rifle battalions.

b. Regimental tank companies.

c. Regimental heavy mortar companies.

d. Division armor.

e. Division artillery.

f. Tactical air units.

g. Armor and artillery of the reserve division.

h. Reserve armored division.

i. Supporting artillery.

j. Chemical units.

52. ENGINEER ECHELON

The engineer echelon is composed of engineer troops and their equipment. It is charged with construction of rafts and vehicular bridges, and maintains near-bank installations and routes of communication.

a. The normal engineer support for a corps includes two or more engineer combat groups, one of which provides direct support to each assaulting infantry division of the assault force. The engineer combat group normally comprises:

(1) Group headquarters.

(2) One engineer panel bridge company.

(3) One engineer dump truck company.

(4) One engineer light equipment company.

(5) One treadway bridge company.

(6) Three or more engineer combat battalions, army.

b. Additional attachments of engineer troops from army may be necessary because of special conditions or characteristics of the water obstacle. In such cases, the additional troops are attached to the corps engineer combat groups, who employ them as needed.

53. FOLLOW-UP ECHELON

The follow-up echelon consists of reserve infantry battalions, general support, far-bank engineers, supporting heavy weapons, medical personnel,

ammunition carriers, communication teams, artillery elements, armored elements, reconnaissance parties, and antiaircraft elements.

54. REAR ECHELON

The rear echelon is composed of administrative units whose duties are not directly involved in or affected by the river-crossing operation. It also includes any other units not made a part of the other four echelons.

Section II. MISSIONS

55. ASSAULT ECHELON

The assault echelon has the general mission of seizing one or more of the three bridgehead objectives, consolidating each objective, and then pushing on to the next objective.

56. FIRE-SUPPORT ECHELON

The primary mission of the fire-support echelon is to support the assaulting troops. This is achieved by:

a. Neutralizing enemy strong points.

b. Firing on targets of opportunity.

c. Providing flank protection by fire, for the attacking troops.

d. Firing counterbattery missions.

e. Disrupting enemy far-bank routes of communication.

f. Harassing enemy troop-concentration areas.

g. Turning back enemy counterattacks.

h. Directing fire against enemy armor.

i. Providing protection against enemy air attack.

j. Destroying all possible enemy observation posts and command posts.

k. Providing directional aid to assault troops by use of tracer fire or smoke shells.

l. Giving support to deception schemes.

m. Providing smoke screens.

57. ENGINEER ECHELON

Missions assigned to the engineer echelon may include:

a. Construction, maintenance, and repair of road nets and routes of communications.

b. Removal of mines and other obstacles.

c. Construction of near-bank ferry and bridge approaches.

d. Construction of footbridges.

e. Construction and operation of ferries.

f. Construction of vehicular bridges.

g. Construction of far-bank exits.

h. Construction of bridge protective devices.

i. Construction of dummy bridges.

58. FOLLOW-UP ECHELON

The follow-up echelon has the overall mission of supporting the advancing troops on the far bank. Specific missions may include:

a. Flank protection and exploitation by armor or infantry.

b. Continuation of the advance by passing through or reinforcing the assault troops.

c. Thorough mopping-up operations on the far bank.

d. Defense against counterattack.

e. Removal of far-bank obstacles bypassed by previous echelons.

f. Evacuation of casualties.

g. Installation, improvement, and maintenance of signal communications across the river.

h. Close fire support of assault troops.

i. Resupply of ammunition for assault troops.

j. Ground and air defense of crossing sites.

59. REAR ECHELON

The mission of the rear echelon is to continue normal operation and cross the water obstacle in accordance with the traffic regulation and control plan.

Section III. EMPLOYMENT

60. ASSAULT ECHELON

a. The assault echelon makes the crossing on as broad a front as possible, with several determined attacks at separate places. Strength in depth is essential to penetrate defenses and to allow the advance on the far bank to continue uninterrupted. The formation of this echelon is governed by the following:

(1) Troops and crossing equipment available.

(2) Enemy disposition and capabilities.

(3) Visibility conditions.

(4) Near-bank approaches, far-bank exits, and river characteristics.

(5) Scheme of maneuver.

b. The tactics of the assault echelon are influenced greatly by the crossing front and boat intervals. At first, the tactics are usually limited to frontal attack by fire and movement. Landing troops push forward rapidly on the far bank to gain room for maneuver against enemy strong points and to reduce the vulnerability of the assaulting troops to enemy fire. Thorough mopping-up operations on the far bank proceed concurrently with the advance to reduce the amount of enemy fire on the water obstacle.

c. Advance to the first objective is as rapid as possible to prevent the enemy from reorganizing and making a coordinated counterattack, before the supporting echelons reach the far bank. Reorganization on the first objective is essential, since greater resistance may be expected during the advance to the second objective. Thorough

reconnaissance, begun as soon as the assault troops reach the far bank, is vital to continued advance, and may locate weak points in the enemy defenses which should be exploited to the fullest extent. (See fig. 11.)

Figure 11. Boat team of assault echelon approaches far shore.

61. FIRE SUPPORT ECHELON

a. The placement and employment of fire-support troops and weapons present problems of a special nature in a river-crossing operation. All artillery fire support, except air support, usually comes from the near bank until the bridgehead is established and crossing facilities are in operation to permit displacement of weapons forward to the far bank of the river. Fire missions must be definitely assigned to successive levels from the top level down. In general, fire support comprises:

(1) Isolation of the bridgehead area.

(2) Neutralization of enemy opposition at the crossing site.

(3) Prevention of enemy artillery fire on the crossing and bridge sites.

(4) Protection against air attack.

(5) Support of secondary or deceptive crossings.

b. Artillery normally organizes to accomplish its missions as it does for other types of combat. Each infantry regiment has one direct-support artillery battalion. This direct-support battalion in turn is normally reinforced by one or more other artillery battalions from the reserve divisions and from corps and army units. All artillery not directly engaged otherwise should be available to corps for counter-battery missions. Control of artillery must be as centralized as possible to secure maximum massing of fires. Artillery and other fire-support weapons must occupy position areas as far forward as possible to give maximum support to troops moving forward from the far bank and to engage any artillery that might fire on the crossing site. All artillery battalions should be registered for the crossing. Reinforcing artillery battalions should register on the same target base point as the direct-support artillery unit which they reinforce. Interdiction fires to isolate the crossing area should be delivered before any troops cross. If the crossing is to be a surprise crossing, the interdiction fires must not be noticeably increased. If the element of surprise is lost, an extensive artillery preparation is fired just before the crossing. This preparation, like any other, begins by neutralizing enemy artillery, then works on enemy communication lines, and finally just before the attack, attempts to neutralize the enemy defending the far bank.

c. Counterbattery fire is much more important in a river-crossing operation than in an ordinary attack situation. The reason for this is that the scarcity of crossing sites canalizes the movement of troops across the stream at points well-known to the enemy. Counter-battery fire is normally controlled by the corps fire direction center.

At the beginning of the attack, counterbattery fires are based on intelligence gained from aerial photographs, prisoners of war, and enemy artillery sounds and flashes. After assault troops have crossed and enemy artillery is displaced, counterbattery fire observation and adjustment depend upon ground forward observers, organic artillery air observers, sound and flash units, and shell reports.

d. Early displacement of artillery forward is vital to continuation of the advance and to exploitation of the bridgehead. Some light, direct-support artillery battalions ordinarily cross by raft before the bridge is erected. Some reinforcing and general-support artillery must cross with the armor immediately after completion of the bridge.

62. ENGINEER ECHELON

The employment of the engineer echelon is determined by the mission of the assaulting force, availability of engineer troops and equipment, and technical characteristics of the water obstacle. The division engineer is responsible for the technical plans for crossing his division. He determines the engineer assistance required and works closely with supporting engineer unit commanders in coordinating engineer support for his division crossing. Engineer commanders responsible for the accomplishment of specific tasks control the necessary engineers and coordinate their activities to best meet the needs of the crossing element. Plans for the deployment of engineers include arrangements for advance parties to do the following: make early reconnaissance, go forward to raft and bridge sites immediately after the leading troops, complete detailed reconnaissance of the crossing site, and start preparatory work.

63. FOLLOW-UP ECHELON

The grouping of the follow-up echelon is kept flexible so elements of the echelon may cross at any time to meet changing conditions on the far bank. This is especially important in the selection and disposition of essential vehicles to be crossed. The follow-up echelon may be crossed by any means available. They may cross: by re-using assault boats, on footbridges, (fig 12) on rafts, in amphibious vehicles, or on bridges. Elements of the follow-up echelon are held under centralized control once they are across the water obstacle. Special efforts are made to insure that the echelon is not jammed into the crossing sites on the near bank and that its elements move forward without delay after arrival on the far bank.

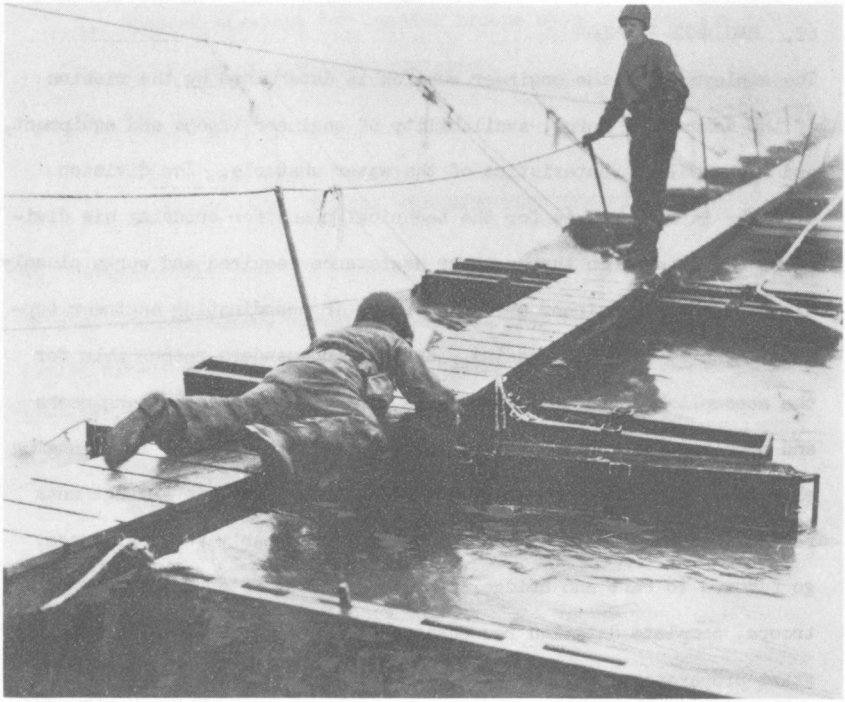

Figure 12. Engineer soldier readies footbridge for use by follow-up echelon.

Chapter 5

INTELLIGENCE

Section I. GENERAL

64. IMPORTANCE

Timely, adequate, and evaluated information is essential for a successful river crossing. Information about the river, its adjacent terrain, enemy dispositions, and related matters must be continuously collected, processed, and disseminated.

65. REQUIREMENTS

Intelligence procedures and requirements for a crossing operation are essentially the same as for other type operations. One difference is that river-crossing operations require more long-range information and more information of a technical nature. For example, it is desirable to have available in the earliest planning stage technical data on the width, depth, velocity of flow, and flood characteristics of the river. Some of these hydrologic data are the result of years of study and observation. It is obvious that such information cannot be assembled during the advance to the river; hence, the heavy reliance on long-range information. The emphasis is on engineer information because the engineers are primarily responsible for bridging and ferrying operations.

66. LONG-RANGE AND DETAILED INTELLIGENCE

Long-range intelligence is that usually performed by high echelon intelligence agencies at the earliest time that a river crossing can be foreseen. It is later extended, supplemented, or verified by corps and lower units as troops advance to the river and become completely familiar with the terrain and the enemy situation. Under these conditions, it is known as detailed intelligence (and reconnaissance).

Section II. LONG-RANGE INTELLIGENCE

67. USE

Long-range intelligence permits commanders of corps and higher units to make general planning estimates. It particularly guides training, discloses special equipment needed, and indicates the supplementary data that must be secured, including data on precipitation and stage forecasting, and flood and weather conditions.

68. REQUIREMENTS

Long-range intelligence must include information on the following subjects.

a. Capabilities of the enemy to oppose the crossing. To include: nature of the terrain; known enemy strength, composition, and disposition; enemy tactics; availability and effectiveness of enemy air support; and courses of action open to the enemy after a bridgehead has been established.

b. River characteristics. To include: width and depth of the stream; its fordability by troops, vehicles, and animals; velocity and character of the current, including cross-currents and undertow, if any; the height, slope, and condition of the banks; the condition of the river bed; the gradient in the direction of flow; location of dams and other man-made structures and their effect on the stream characteristics; and flood and ice conditions.

c. Natural and man-made obstacles. To include: data on location and extent of natural and man-made obstacles, and their possible effect on movement of both foot troops and vehicles. Natural obstacles include: cliffs, steep embankments, ravines or draws, tributary streams, marshy areas, sand bars, falls and rapids, and woods or other vegetation. Man-made obstacles include: enemy positions strengthened by wire, piling, or scaffolding; underwater obstacles of various types; earthworks; and mine fields.

d. Nature of terrain. To include: information about assembly and dispersal areas, cover and concealment near the crossing sites, and terrain suitable for positions for supporting weapons, observation posts, and supply installations; information about the terrain on the far bank, including terrain suitable for enemy defensive use or our objectives, and space for maneuver and reorganization by our own troops.

e. Road nets and approaches. To include: data regarding routes of advance beyond the projected bridgehead, in addition to road and rail nets to the crossing sites.

f. Assault crossing sites. See paragraph 89.

g. Local resources in the area. To include: information on available timber, structural steel, hardware, wire, tools, sand, gravel, boats, barges, and ferries, as well as production facilities for steel, other metal products, and lumber.

69. SOURCES

Sources of long-range intelligence information may include any of the following:

a. G-2, Department of the Army. G-2 continuously collects information of all types regarding all geographic regions, during war or peace. When information about certain rivers to be crossed in a campaign is desired, he can usually supply much information at the outset of the campaign.

b. Engineer Research Section of Army Map Service. This agency operates under the Office of the Chief of Engineers. It assembles topographical and other technical information given to it by the G-2 and the Chief of Engineers.

c. Intelligence surveys and studies. Intelligence surveys and studies are published for specific areas. Known as Inter-Service Information Series (ISIS), Joint Army-Navy Intelligence Studies (JANIS), or National Intelligence Surveys (NIS), they cover the geography,

geology, hydrography, topography, and other technical aspects of areas of interest to military planning personnel. These studies are usually available at division and higher headquarters.

d. Air photographs. Air Force units photograph areas deep inside enemy territory. These photographs are combined into mosaics, or made by photogrammetric processes into topographic maps that present timely and accurate information.

e. Local maps. Local maps provide important river-crossing data. Topographic maps are the most valuable, but civilian road maps and local town and provincial maps furnish important information on road conditions and cultural features.

f. Local civilians. Some displaced civilians are familiar with the river to be crossed and may give information which cannot be found in publications or on maps. Local engineers, ferry and river-boat pilots, levee-or dike-construction contractors, fisherman, flood-control officials, dredging contractors, and enemy prisoners of war can often furnish valuable information.

Section III. DETAILED INTELLIGENCE

70. USE

Detailed intelligence and reconnaissance is the basis for the operation commander's final crossing plan. It reveals information on the terrain and weather, and on the enemy's disposition, identification, strength, and composition. This information may change the entire conception of the operation. An important consideration is that essential information be distributed to all echelons as soon as it is obtained. Detailed intelligence is normally gained by corps and lower units as the result of direct ground or air observation.

71. REQUIREMENTS

Detailed intelligence extends and verifies the long-range intelligence requirements described in paragraph 68. Special information requirements of forward tactical and technical echelons as well as rear echelons are outlined below.

a. Forward tactical elements. Forward tactical elements require reconnaissance data on—

(1) Terrain. To include:

(a) Crossing sites; covered routes of approach.

(b) Locations for main and secondary attacks and feints, and for unit boundaries.

(c) Critical terrain features on both sides of river.

(d) Locations for observation points, command posts, assembly areas, positions for supporting weapons.

(e) Natural and man-made obstacles.

(f) Routes for wire laying; wire-crossing sites along the river.

(g) River characteristics, trafficability of banks, access roads to and from the river. This information is especially valuable to armored units and units having amphibious vehicles.

(2) Enemy strength, composition, and disposition. To include:

(a) Location of enemy weapons, fields of fire, observation points, and reserves to meet requirements of friendly infantry, engineers, supporting artillery, air, and tank units.

(b) Location of enemy artillery positions, assembly areas, supply installations, communication routes, and other targets for friendly artillery.

(c) Enemy air capabilities.

(d) Tactical dispositions of the enemy which may influence requirements for smoke or other chemical support.

(e) Location of man-made obstacles protecting enemy's positions; the extent these positions are organized and developed.

(3) Our own forces. To include: disposition, strength, and condition of troops, movements, successes or reverses, countermeasures against enemy threats.

b. Forward technical elements. Forward technical elements require detailed reconnaissance data on—

(1) Width of river.

(2) Existing depth of river (with date); profiles near banks.

(3) Probable mean and maximum velocities of flow during operations.

(4) Hydrologic data; rainfall and flood characteristics, including possible and probable stages during operations.

(5) Condition and soil characteristics of banks, bed, and approaches.

(6) Road net and its condition.

(7) Demolished bridges; condition of piers and abutments.

(8) Sand bars, islands, or wrecks in the river.

(9) Sites for boats, rafts, and floating bridges.

(10) Capacity of existing crossing means such as bridges, fords, ferries.

(11) Local civilian craft, their condition and size.

(12) Local construction materials.

(13) Possible equipment parks.

(14) Possible troop assembly areas.

(15) Underwater obstacles.

(16) Mines and vehicular obstacles.

(17) Possibility of controlled flooding by the enemy.

(18) Floating debris and mines, and swimming saboteurs.

(19) Characteristics and relationships of prospective crossing sites from viewpoint of motorized and mechanized elements of the assault force.

c. Rear echelons. Although rear echelons do not normally come in direct contact with the enemy, they must be kept informed of the tactical situation so their commanders can make sound dispositions of equipment and troops. Special information is required on the following items:

(1) Possible locations for dumps, depots, parks, clearing stations, hospitals, and other necessary installations.

(2) Avenues of supply, evacuation, and communication.

72. SOURCES

Sources of detailed intelligence include:

a. All the long-range intelligence-collection agencies discussed in paragraph 69.

b. Those air-reconnaissance collecting agencies shown on table VI.

c. Ground reconnaissance and patrols (table VI).

d. Prisoners of war.

TABLE VI. Information items and sources

Item	Source						
	Tactical air	Light observation air	Armored cavalry	Infantry reconnaissance	Engineer reconnaissance	Local civilians	Prisoners of war
Enemy infantry, near bank			X	X		X	X
Enemy infantry, far bank	X			X		X	X
Enemy artillery	X	X					X
Enemy antiaircraft artillery	X	X					X
Road net & road condition, near bank		X	X	X	X	X	
Road net & condition, far bank	X				X	X	
Intact bridges, blown bridges	X		X		X	X	X
Condition & strength of bridges			X		X		
Assembly areas, equipment parks		X	X	X	X		
Assault boat crossing sites				X	X		
Bridge sites	X		X		X		
Off-road trafficability			X		X		
Mine fields or obstacles, near bank		X	X	X	X	X	X
Mine fields or obstacles in river	X			X	X		X
Mine fields or obstacles, far bank	X			X	X		X
River width		X			X	X	
River depth (profiles)					X	X	
River velocity					X	X	
Banks, levees, dikes		X	X	X	X	X	
Condition of blown bridges, piers, & abutments					X		
Civilian craft	X	X			X	X	
Local materials (lumber, etc)		X	X		X	X	

Section IV. INTELLIGENCE SUMMARY

73. GENERAL

The intelligence summary for a river crossing is the culmination of all long-range and detailed intelligence affecting the operation commander's final plan. It is prepared by the G-2 with the help of the unit engineer and other interested staff officers.

74. FORM

The intelligence summary may take the form of a written report or a situation map (see fig 13). When it is in the form of a map, it shows all essential elements of information such as existing bridge sites, stream data, enemy dispositions and installations, obstacles, road nets, and other essential data. It also indicates the source of the data.

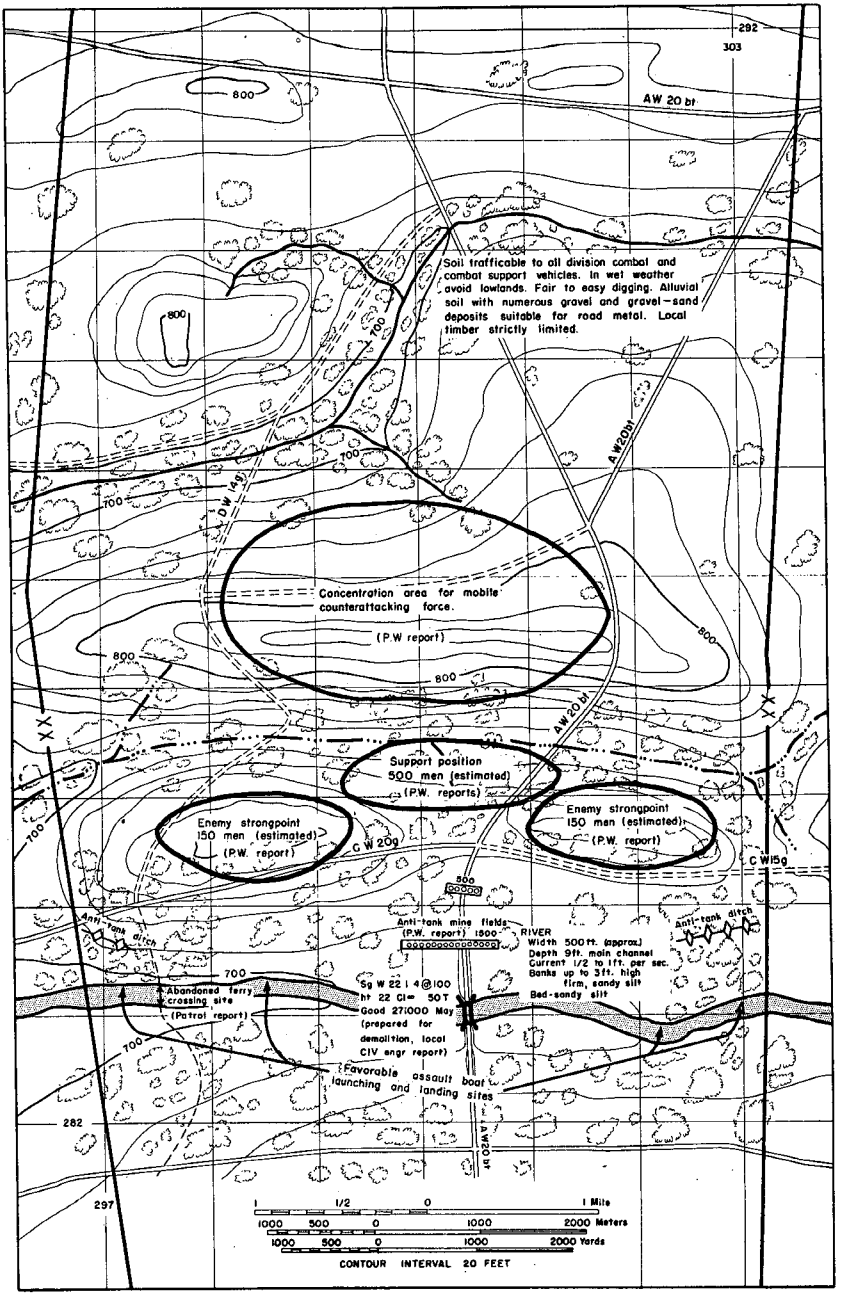

Figure 13. Intelligence summary for a river crossing; example of a situation map.

Chapter 6

PLANNING AND PREPARATION FOR A RIVER-CROSSING OPERATION

Section I. LEVELS, SEQUENCE, AND TECHNIQUES OF PLANNING

75. GENERAL

This section covers the following aspects of planning: levels, sequence, and techniques; responsibilities; coordination with Air Force and Navy; planning restrictions; and main elements of the division tentative or outline plan. The next section is concerned primarily with general planning considerations. The rest of the sections deal with planning and preparation for specific actions such as assembly and crossing, establishment of bridgehead, and development of crossing means.

76. LEVELS OF PLANNING

Planning for a river-crossing operation may be done at any or all of the following levels: Department of the Army, theater, army group, army, corps, or lower echelon (division or lower). Long-range planning is ordinarily done by corps and higher echelons; short-range and current (or detailed) planning, by division and lower echelons.

77. SEQUENCE

For general sequence of planning, see paragraph 9. Long-range planning begins in the highest headquarters, which disseminates advance warning orders, necessary information, and technical details throughout the pending river-crossing operation. This enables the lower echelons to initiate their own tentative plans and alert their subordinate units. Units actually engaged in the crossing finalize the tentative plans that were prepared by higher headquarters as they advance to the river and prepare to cross it.

78. CONCURRENT ASPECT OF PLANNING

As in any other type operation, the earlier those who are to participate in the operation can be brought into the planning picture, the better. Plans can thus be developed concurrently at all interested levels, with each developing the long-range plans to fit its specific needs. Such wide planning must be characterized by close liaison, since each headquarters must be constantly informed of the general developments and the activities of each successive planning level.

79. COORDINATION WITH AIR FORCE AND NAVY

Since a river-crossing operation requires close air support, consideration must be given throughout all phases of planning to the information and planning requirements of the Air Force. If the crossing operation is likely to involve the use of naval personnel, similar attention must be given to the Navy's requirements. Air Force, Navy, and Army commanders should constantly exchange information, coordinate plans, discuss mutual problems, and maintain close personal liaison.

80. STAFF PROCEDURE

Commanders of all echelons are responsible for planning operations with which they are concerned. G-3 is responsible to the unit commander for development of the crossing plans. In discharging his duties, G-3 works closely with the unit engineer, who has a primary interest in this type of operation. Combat plans, including all possible alternatives, must be prepared well in advance so they can be examined by G-4 to determine whether they can be logistically supported.

81. PLANNING RESTRICTIONS

The following factors influence the preparation of plans at all command levels:

a. Security restrictions.

b. Possibility of fundamental changes in the basic plan.

c. Time available.

d. Possibility of overburdening the planning staffs of subordinate units to the point where the effectiveness of their current operations is materially affected.

82. TECHNIQUE OF PLANNING

A river-crossing operation is the outgrowth of continuous preliminary planning developed by various unit staffs. This continuous planning must be consistent with the changing tactical and logistical conditions in the theater. Detailed planning at the level of the force which is responsible for the establishment of the bridgehead is then best developed by planning backward from the objective area and in the following sequence:

a. Determine length of bridgehead line.

b. Estimate strength and type of troops necessary to hold bridgehead line.

c. Determine time available for seizing bridgehead line.

d. Consider seizure of intermediate objectives in reverse order.

e. Estimate strength and allocation of assault troops.

f. Determine most advantageous crossing areas.

g. Determine special training and amounts and types of crossing equipment required for the operation.

83. MAIN ELEMENTS OF DIVISION PLAN

Initial division planning is concerned with preparation of a tentative or outline plan that is to guide staff and subordinate commanders in the course they are to pursue when they reach the river. The main elements of this plan are listed below.

a. Tentative crossing sites.

b. Tentative time and formation for crossing.

c. Plans for coordination of command.

d. Tentative plans for deception.

e. Probable objectives on far side of river; designation of troops to capture them; missions of supporting arms.

f. Tentative allotment of crossing equipment.

g. Approximate location of staging and assembly areas; responsibility for protection against air, airborne, and water-borne attack.

h. Composition of the leading troops and reconnaissance parties; limitations to be imposed on forward reconnaissance.

i. Traffic-control arrangements.

j. Movement of special crossing troops and equipment into position.

k. Signal communication.

l. Special missions for leading troops upon reaching the river.

m. Screening of civilian population.

n. Air support.

Section II. GENERAL PLANNING CONSIDERATIONS

84. SCOPE

This section discusses certain items that must be considered in preparing detailed plans for the units taking part in a river-crossing operation. The order of presentation is listed below.

a. Reconnaissance and intelligence.

b. Troops available.

c. Enemy dispositions and capabilities.

d. Selection of bridgehead objectives.

e. Assault crossing sites.

f. Seizing and holding near bank.

g. Crossing of troops.

h. Controls.

i. Timing.

j. Fire plan.

k. Use of smoke.

l. Air support.

m. Signal communication.

n. Illumination.

o. Ground defense on near bank.

p. Defense against air attack.

q. Logistical support.

r. Replacements.

s. Reserves.

85. RECONNAISSANCE AND INTELLIGENCE

Chapter 5 outlines the specific preliminary information needed to complete the detailed crossing plan.

86. TROOPS AVAILABLE

a. Early in the planning phase a complete and detailed study is made of the troops required and available for the operation. The number of troops of all arms required in the assault will be determined by the ultimate size of the bridgehead needed to cover the crossing and provide adequate maneuver space for the exploiting forces. Consideration is given to the strength, training, morale, and combat experience of each of the units that will take part in the operation.

b. The troop study includes not only assault division troops but all supporting troops as well. The availability of these two categories of troops determines to a large measure the scope and type of the operation to be planned. Individual and special equipment requirements are considered concurrently with troop requirements.

87. ENEMY DISPOSITIONS AND CAPABILITIES (See pars 20 and 21)

Any attempt to force a hasty crossing against strong opposition lays the assaulting forces open to probable defeat. Aerial photographs normally show the extent of the defenses guarding a river line. A strong defense calls for a deliberate, well-planned crossing; a weak

defense may allow a hasty crossing. In that case, the leading troops push forward quickly to cross the obstacle at places where the opposition appears weakest. These troops are rapidly reinforced by both men and equipment to exploit the bridgehead gained.

88. SELECTION OF BRIDGEHEAD OBJECTIVES

a. The three bridgehead objectives (par 29) should be carefully delineated after aerial reconnaissance and careful map study.

b. The objective area limits are preferably outstanding terrain features easily recognizable from the air and ground, as well as on a map. Even though the leading troops can go forward rapidly after crossing, each successive objective should be consolidated in order to secure the bridgehead. Mopping up on the far bank must be thorough to avoid interference with work and traffic at ferry and bridge sites. If opposition is light, the assault troops may be ordered to exploit beyond their assigned objectives, since the advance that follows will cover the crossing for the rest of the force.

89. ASSAULT CROSSING SITES

Desirable requirements for assault crossing sites include those listed in paragraphs 42 and 43 for rafts and floating bridges, plus the following:

a. Undefended crossing points if possible.

b. Good avenues of advance to objectives on the far shore.

c. Dominating ground on the near shore for support of the attack by overhead fire and artillery observation.

d. A salient toward the attacker.

90. SEIZING AND HOLDING THE NEAR BANK

The mission of seizing and holding the near bank is normally assigned to a unit not taking part in the initial crossing-assault. This unit thoroughly mops up the near-bank area during the advance to the river to eliminate enemy interference and observation. Arrangements must

be made for the assaulting units to reconnoiter the river and prepare near-bank installations. Adequate security must be provided along the river and on both flanks of the zone of activity to prevent enemy observers and patrols from returning to the near bank. Special precautions must be taken to prevent sabotage, particularly of engineer floating equipage both in supply dumps and on the river.

91. CROSSING OF TROOPS

a. The order in which units cross is determined by the infantry commander. The width of the stream, terrain characteristics, enemy capabilities, and the equipment and troops available determine the number and the composition of waves crossed.

b. Plans must provide for moving the troops and equipment to selected positions in readiness for the operation. The usual sequence is as follows:

(1) The assault infantry moves through the assembly areas, attack positions, and thence across the stream.

(2) The assault engineers move through the attack positions to their designated task assignments.

(3) The fire support elements move into assembly areas for crossing or into positions from which they can provide covering fire.

(4) Succeeding crossing elements of the assault force move through concentration or assembly areas at the proper time.

c. Engineers are assigned to specific boat groups before the infantry boat groups arrive at attack positions. The infantry must make final plans for the attack before leaving the assembly areas. Engineer guides meet the infantry boat groups at the attack position and lead them over a previously reconnoitered route to the embarkation point. Supporting fires for the crossing are furnished by the fire support echelon.

92. CONTROL OF COMBAT UNITS AND BRIDGING

For overall command and control, see paragraphs 13-15.

a. Combat units. During planning, the extent and limits of decentralization of command of combat units are carefully worked out.

(1) Movement from attack positions to crossing points, embarkation, and crossing are responsibilities of the engineers and are coordinated through the commanders of infantry elements.

(2) Infantry squad, platoon, and company commanders designate rallying points on the far bank to be used in case effective control is lost during the crossing.

(3) Detailed control of movement of division elements across a river is retained by the division commander only as long as such control is necessary to assure effective development of the bridgehead. As soon as possible, usually after the combat elements have crossed, the corps commander assumes direct responsibility for movement across the river, so the division commander may concentrate on far-bank problems.

b. Bridging. (1) Footbridges, infantry support bridges, and rafts are constructed and made available to the assault divisions on the division commander's orders. Initiating construction of heavy bridges, however, depends on a number of considerations. From the division commander's point of view, the sooner heavy bridges are constructed, the easier it will be to bring over division tanks, ammunition vehicles, engineer equipment, and supplies and equipment for division troops for further attack or bridgehead defense.

(2) From the corps commander's point of view, construction of heavy bridges before the crossing site is safe from effective enemy artillery fire exposes critical equipment to probable destruction. Once the bridge is constructed he can get enough troops and equipment to the far shore to organize a coordinated attack for continuation of his advance. The corps commander thus faces two problems. He may not

build the bridge soon enough, and as a consequence troops on the far shore may suffer a high percentage of casualties because of inadequate far-shore supporting armor and artillery, and enemy forces may be able to assemble for opposition. Or, he may build the bridge too soon, and possibly have the bridge destroyed by enemy action, creating a much longer delay in reinforcing bridgehead troops.

(3) The above considerations generally make it perferable that the corps commander retain the responsibility for initiating construction of the bridge, rather than the division commander. The corps staff and in particular the corps engineer must work very closely with the crossing divisions so communication difficulties or other factors do not cause delay in initiating and completing bridge construction.

93. TIMING

Specific acts that must be carefully timed to insure the success of the crossing are listed below.

a. Movement of assaulting troops into attack positions.

b. Movement of reserve elements including vehicles and armor into assembly areas.

c. Movement of engineer assault crossing, raft, and bridging equipment into equipment parks.

d. Use of smoke.

e. Feints, demonstrations, and deceptive measures.

f. Artillery preparations.

g. Preparatory air strikes.

94. FIRE PLAN

a. When the assault is to be made at night, a silent crossing often achieves surprise. But a fire plan must be ready for use on call, and the commander whose duty it is to decide when fire should be opened must be designated in the orders (see par 18m). Artillery fire may be desirable in the later period of a night assault to cover the noise and movement of night bridging operations.

b. For a daylight assault, the maximum amount of fire support should always be planned. The area of attack should be isolated by artillery fire, bombs, and smoke. Field artillery forward observers cross the river with the leading elements and call for fire as needed. Other ground observers request fires through liaison officers normally stationed at battalion and regimental command posts. Air observers call for and direct fire by direct radio communication with the fire direction center. The fire must be controlled on the highest level until after the obstacle has been crossed; it may then become expedient to decentralize control of some of the supporting weapons. Supporting artillery units should be assigned specific fire missions in the zones of the assaulting troops, but must be under centralized control so their fire may be ordered lifted at a moment's notice and transferred to other targets presented by the changing tactical situation. Division artillery and mortar positions should be close to the river line so these weapons may support attacks well beyond the water obstacle. During the later phases of the crossing, while division artillery units are being displaced forward across the river to provide the close support for the continued advance, supporting long-range artillery units must be capable of providing much of the supporting fire for the assaulting troops. A special fire mission may be necessary to cover the flanks of the bridgehead. This mission may be given to any available armor, but provisions must be made to have artillery ready to replace the armor when it is pulled out to cross the river. The fire support plan must be closely coordinated with the specific missions and targets of the tactical air support.

c. Division and regimental armor may be used to cover the assault after the artillery preparation has lifted. These tanks should be sited where they can fire directly on the actual landing frontage. Amphibious tanks may be employed either to support the assault, or to hasten the build-up by getting armor into the bridgehead before the heavy rafts are operating.

95. USE OF SMOKE

Smoke is frequently the only effective means of concealing friendly activity on the near bank from the enemy. Some of the things that must be considered in using smoke are discussed below.

a. The demands of ground and air observation may conflict. The allocation of "smoke" and "nonsmoke" periods may solve this problem and help confuse the enemy.

b. The smoke screen must not interfere with operations of units on the flanks.

c. The area on the far side of the river must be clear of smoke by D-day if airborne forces are to be landed.

d. Any new positions taken up by the artillery immediately before the start of the operation must be carefully concealed in another way if the smoke screen must be lifted.

e. The reactions of the enemy to the smoke screen, and his resulting countermeasures, must be observed and taken into account.

96. AIR SUPPORT

The tactical air support maintains local air superiority. It also makes attacks as required by the assaulting troops against local routes of communication, communication centers, enemy strong points, and later against centers of enemy resistance or enemy armor. Before the major assault is made, air attacks must not be so localized that the enemy may judge accurately the location of the forthcoming assault. Sorties by low-flying aircraft will help cover the noise of armor, guns, and motors moving into position before the assault.

97. SIGNAL COMMUNICATION

Multiple communication means must be crossed early in the assault so commanders can keep informed of the progress of the operation on the far side of the water obstacle. Radio must handle the bulk of communications traffic because wire and messenger service may be difficult

to maintain. All participating assault units must be tied in to the communications net. Some units that normally have heavy communications traffic, such as the engineers, must have their own radio and wire network. A unit command radio net is maintained for communication with subordinate elements. At least one radio set should be operated in the radio net of the next superior headquarters. The wire net is tied into the switchboard of each assaulting unit. Communication must be maintained between engineer units, each assaulting regimental commander and his local engineer commander, raft and bridge areas, the engineer commander, and division headquarters (see FM 7-24 and FM 17-70).

98. ILLUMINATION

For a night crossing the use of artificial illumination must be considered (see par 25). A silent crossing under the cover of darkness may be desirable for the initial assault but after surprise is lost, the use of artificial illumination will speed the attack. It can be used to disclose enemy positions on the far side of the river and to provide light for reorganizing troops for the advance. Construction of rafts and their approaches and the flow of essential vehicles across the water obstacle and into the bridgehead during the hours of darkness may be hastened through the use of artificial illumination. Searchlight equipment is normally obtained from searchlight units or Army depots.

99. GROUND DEFENSE OF BRIDGE SITE

a. The troops assigned the mission of near-bank defense must be prepared to attack and neutralize enemy stragglers missed during the mop-up operation, enemy patrols, and infiltrating forces. The local defense of bridge sites includes protection against floating mines, river craft, and swimmer demolition parties. Troops with the mission of ground defense of bridges must remain in position until a sufficient

force has crossed into the bridgehead to secure the sites against enemy counterattack. Therefore, line of communication troops guard the bridges as long as there is danger of their being captured or destroyed. (See par 18d(1).)

b. Antitank defense of the bridgehead is so important that the first bridges to be built must, if possible, be sited with their approaches on the far bank covered by areas readily defended against tanks. Antitank weapons and vehicles carrying antitank mines for bridge-site defense must be given a high priority to cross the water obstacle.

100. DEFENSE AGAINST AIR ATTACK

a. See paragraph 18d(3). Although they present small targets, bridges are nonetheless susceptible to attack by aircraft. Smoke can be profitably used to protect them from this danger (fig 14). Concentration and assembly areas, supply points, and equipment parks are also susceptible to air attack.

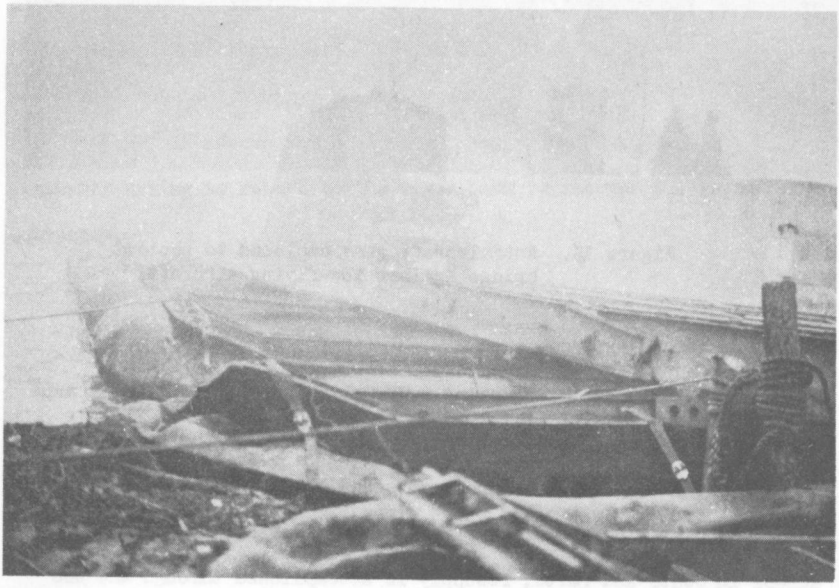

Figure 14. Smoke used to conceal bridge from hostile observation and air attack.

b. Antiaircraft guns must be deployed at the earliest opportunity to protect the construction of bridges and the crossing of troops and vehicles (fig 15) against air attack. Positions for guns must be reconnoitered on the far bank, and guns ferried across and moved into position as soon as the assault force has established itself. These guns may, as a secondary role, be sited for antitank defense.

Figure 15. Antiaircraft guns emplaced to protect bridge against low-flying aircraft.

101. LOGISTICAL SUPPORT

a. As soon as the crossing means allow, dumps of items or supplies which the assault troops require are set up on the far bank of the stream by the assaulting regiments and controlled by them until normal supply is possible. The initial supplies are transported across in boats and rafts; resupply is accomplished through the use of preloaded vehicles that cross by bridges or rafts as soon as

possible after the initial assault. Normal supply procedures are resumed once the crossing means permit the accommodation of supply and administrative vehicles.

b. A preliminary administrative plan is drawn up and issued to units with the division outline plan. Changes and amendments necessitated by the tactical situation are then embodied in the detailed plans. If airlift is possible, supply by air may be effected. This may help particularly in the early stages of the operation, since airlift can carry much of the supply tonnage which would otherwise have to cross the obstacle by water. Light aircraft may be used to drop critical supplies into the bridgehead or to carry supplies ground-to-ground, across the stream.

c. Some things to be considered in the plans for logistical support are discussed below.

(1) Class I supplies. Normal requirements for Class I supplies must be met, with individual assault rations being used extensively. Each person should carry one ration with an additional ration carried in unit supply. Canteens should be full at the start of the operation and water purification tablets carried by each man.

(2) Class III supplies. A Class III supply point in the bridgehead must be established promptly. The size of this supply point depends on the number of vehicles employed in exploiting the bridgehead and on the requirements of the later phases of the operation.

(3) Class V supplies. Class V loads should be determined before the start of the operation. The amount carried for each weapon must be carefully calculated, since this class of supply may become critical during the operation. Ammunition carriers and resupply vehicles must have a high priority on the essential vehicle list.

(4) Medical evacuation. Arrangements must be made for either ambulances or other vehicles with stretchers to cross the river early in the operation to collect casualties. A system must be provided for

the prompt evacuation of casualties back across the obstacle. Reinforced engineer boat teams at specific points or returning amphibious vehicles are designated to provide the evacuation means in the early phases of the operation (fig 16). As soon as ferries are in operation, they are used to cross and return ambulances for evacuation.

Figure 16. Assault boats may be used early in the operation to evacuate casualties.

102. REPLACEMENTS

Battle and nonbattle casualties will ordinarily average about 5 percent of the effective strength per day for front-line divisions during the actual crossing and the consolidation on the far bank. Assault units that become depleted in personnel normally receive replacements after they have been passed through by reserve units moving forward, have been withdrawn from contact, or have accomplished their objective and reached relatively stable positions.

103. RESERVES

Commanders of all echelons hold a reserve element in readiness to exploit advantageously any unexpected situation. It is particularly important that division reserves be ready to move through the assault troops to continue the advance to the bridgehead objectives. The reserve regiment must have advance parties accompanying the forward regiment(s), so they will be familiar with the terrain and the situation when the regiment is committed. Corps reserve infantry division (s) must be in a position to help gain the objectives necessary to establish the bridgehead, to exploit success, and for use in far-bank mopping-up operations. Any armored divisions available to the corps are usually held in reserve during the assault crossing and committed at an opportune time to exploit success, pursue retreating enemy troops, and dissipate major enemy counterattacks. Casualties must be expected in the engineer forces, both in assault boat teams and construction crews. A reserve in equipment and troops is necessary to assure that the vital across-river life line is kept open and in operation, particularly in the initial phases.

Section III. TRAFFIC REGULATION AND CONTROL

104. TRAFFIC REGULATION AND CONTROL PLANS

Traffic regulation-and-control plans are drawn up to govern movements of troops and equipment through all operational phases of a crossing.

a. Each division G-4 plans regulations and controls for his division.

b. Corps G-4 coordinates the division regulation-and-control plans, integrates them, and plans for the period after corps assumes responsibility for traffic regulations and controls. See figures 17, 18, and 19.

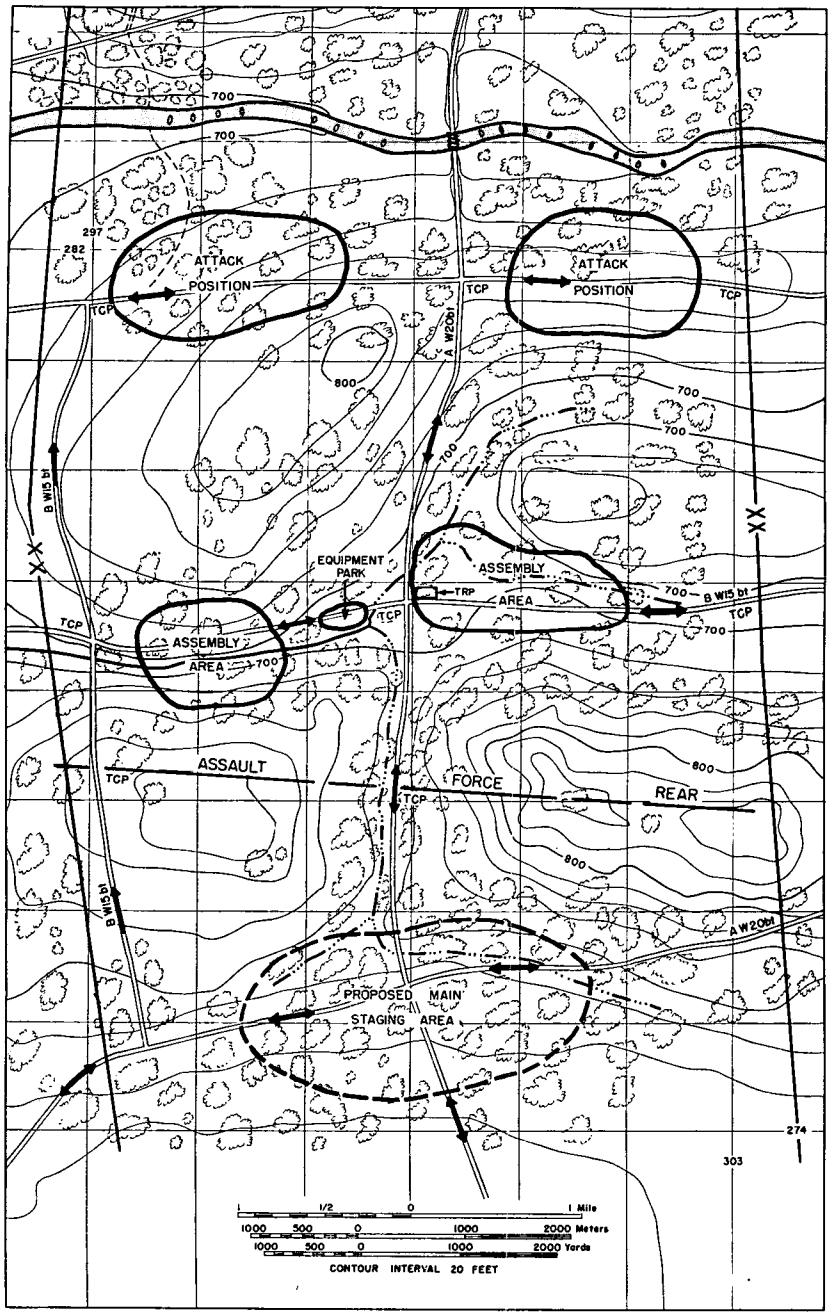

Figure 17. Traffic control and circulation at start of crossing operation.

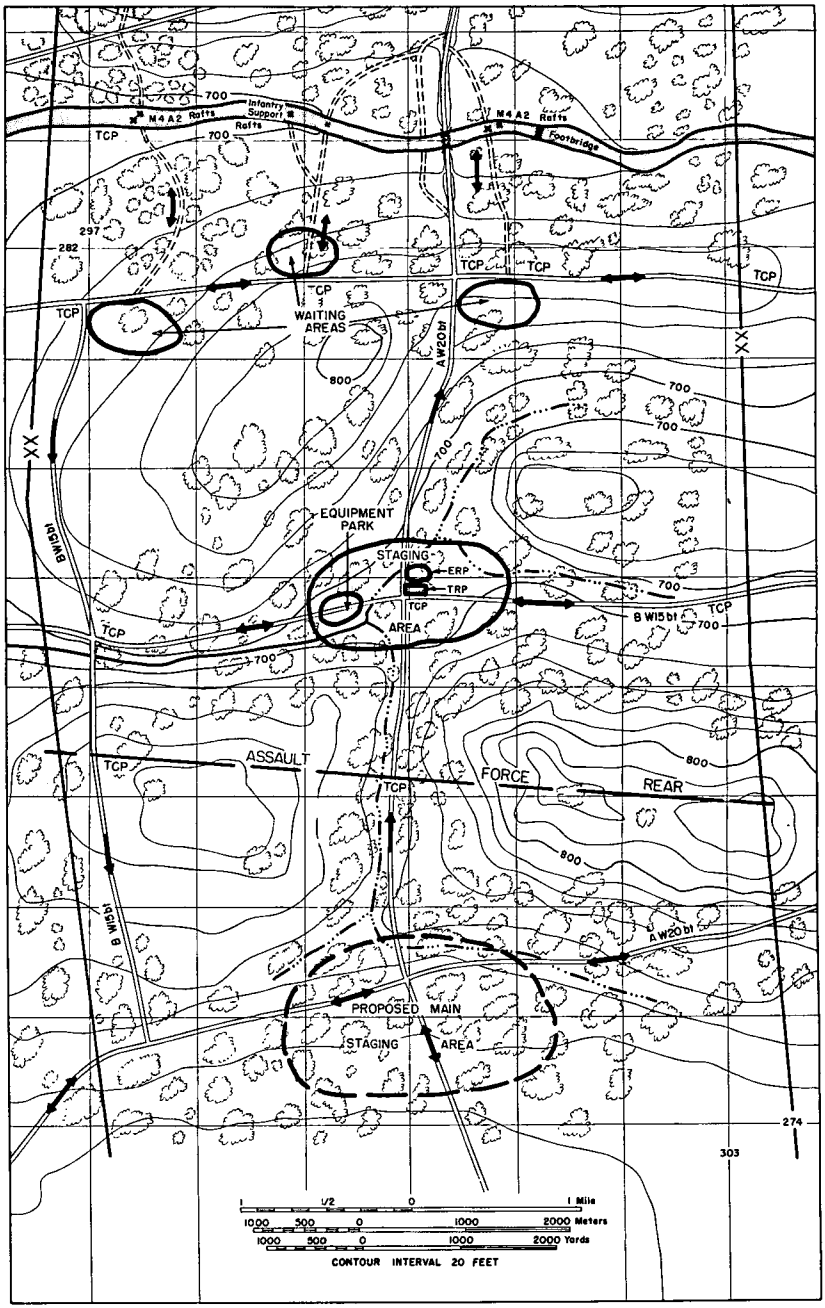

Figure 18. Traffic control and circulation after attainment of first objective.

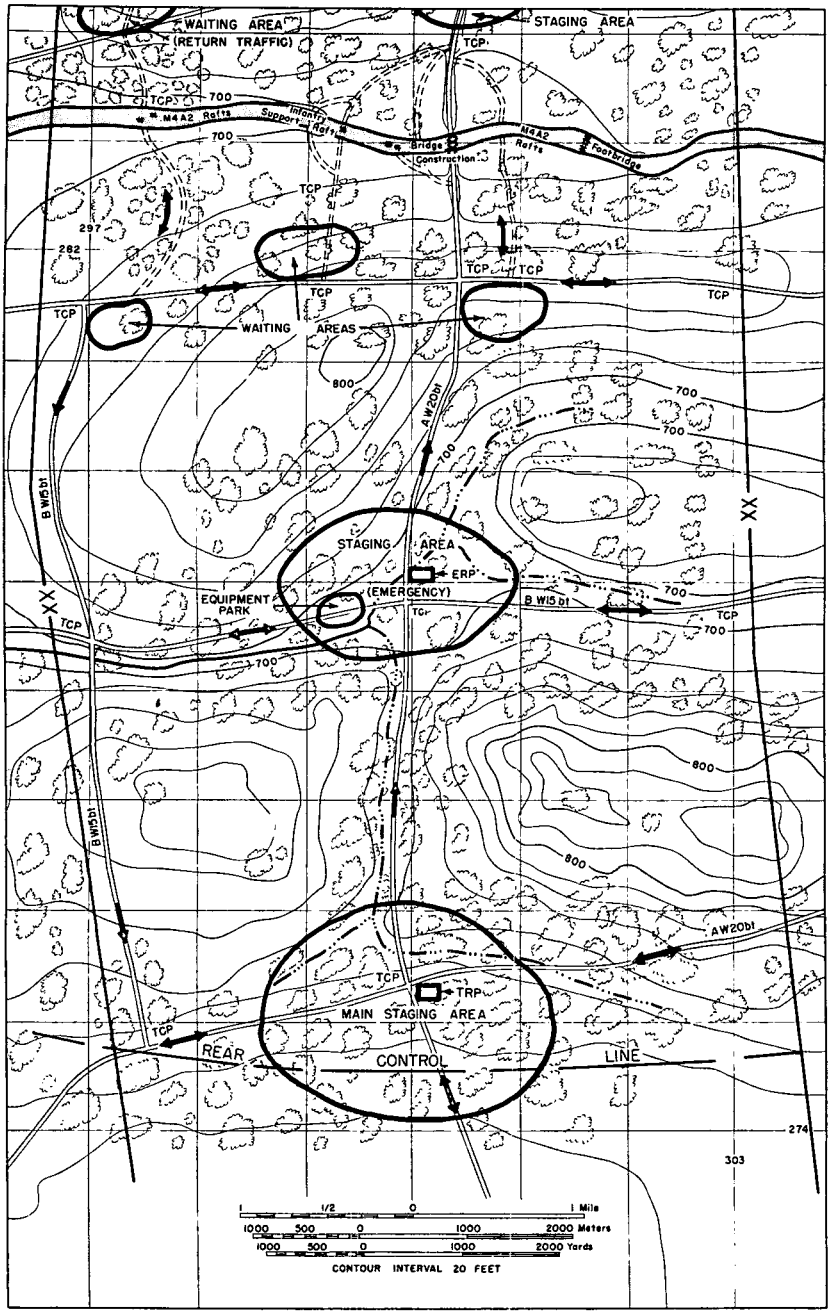

Figure 19. Traffic control and circulation after attainment of second objective.

105. SCOPE OF PLANS

Division and corps traffic control plans must:

a. Integrate control of movement throughout the operational area.

b. Provide main and emergency staging areas.

c. Establish a thorough communication system connecting staging areas, control points, both ends of the bridges, and other important points.

d. Set up control points and military police control.

e. Allow enough flexibility to permit directing of traffic to various crossing sites.

f. Draw up a traffic-circulation map.

g. Locate the assault force rear line. Forward of this line, each assault-division commander controls and regulates traffic. The line is usually moved forward after essential division vehicles have crossed the water obstacle.

h. Locate the rear control line. This is the line forward of which the corps commanders control and regulate traffic.

i. Make arrangements covering transfer of traffic-regulating responsibility from divisions to corps.

j. Prepare a priority list giving primary consideration to the needs of the assault divisions.

k. Arrange for changes to take care of unforeseen events.

106. DEFINITIONS

a. Assembly areas. Assembly areas are spaces in which the elements of the assault force are assembled preparatory to further action. For a crossing operation, forward or final assembly areas are further designated as attack positions (see fig 17).

b. Main and emergency staging areas. Main staging areas are waiting spaces for vehicles approaching to cross the bridge. They are located far enough from the river to allow the alternate roads

to raft and bridge locations to be used to greatest capacity. Sites selected for staging areas should feature cover and concealment, easy accessibility, and enough room for vehicle and equipment dispersal. Emergency staging areas (waiting areas) are spaces provided near bridge and raft sites to prevent vehicles waiting to cross the river from having to stand on roads and thus restrict traffic flow.

c. Engineer equipment parks. Engineer equipment parks are spaces reserved near bridge and ferry sites for the central assembly of vehicles, equipment, and material to be used during the operation.

d. Traffic regulating point (TRP). TRP is an installation where a responsible headquarters controls the elements of highway movement by prescribing schedules, detours, diversions, direction of movement, and changes thereto when necessary to maintain efficient traffic flow. These instructions are carried out by traffic control points.

e. Traffic control point (TCP). TCP is a point where one or more persons are stationed to enforce the traffic-regulation plan and road discipline, and to give spot direction. This enforcement is a function of the provost marshal.

f. Engineer regulating point (ERP). ERP is a point where a responsible engineer headquarters exerts technical control to insure proper use of the river-crossing means. The headquarters normally exercises control by making appropriate recommendations to the traffic regulating points, which in turn issue instructions for enforcement to the control points. This technical control includes:

(1) Examining vehicles to prevent improper loading with respect to technique, weight, or dimension (fig 20).

Figure 20. Improper loading technique causes raft to capsize.

(2) Recommending rerouting or halting of certain traffic when technical difficulties make one or more of the crossing means inoperable or reduce its capacity.

(3) Assisting the traffic regulating points in maintaining maximum traffic density on the provided means.

107. PRIORITY CONVOYS

Essential vehicles (par 113) and tactical units are scheduled according to their priorities for crossing the bridges. Armored vehicles, artillery, communication, and ammunition resupply vehicles are normally given a high priority. The convoys are plainly marked with their priority number, to enable traffic control personnel to arrange them in the staging areas in an orderly way, so the convoy may be put on the road in order of priorities, and with the minimum of unnecessary movement and confusion. Escorting by traffic-control vehicles

of high-priority convoys may be necessary to speed up the movement of such convoys from the staging area into the bridgehead.

108. CIVILIAN, PW, AND DP CONTROL

Rigid control of the movement of civilians, prisoners of war, and displaced persons is necessary. These people must be screened and moved quickly and efficiently away from the river and to the rear of the staging areas. Under no circumstances should they be allowed to move in the direction of the river line from the near-bank area. Civilians, displaced persons, and prisoners of war must not be allowed to assemble along the far bank of the river as they move from the far-bank fighting zone to the rear of the near-bank areas. They must be crossed promptly on any available secondary means. It may even be necessary to establish extra assault boat ferries to assure their rapid passage to the rear, a procedure which would also keep them away from the main ferries and bridges. Separate routes for their use should be established and controlled to avoid congestion of the main troop and vehicular routes. A prisoner-of-war collecting point must be established where prisoners of war are transferred from division to army control for the move to the rear.

109. RETURNING VEHICLES

Until the crossing operation has reached the stage where the entire road net, including river-crossing means, is adequate for traffic requirements, the problem of returning vehicles must be carefully coordinated. Designating certain ferries for the exclusive use of returning vehicles may be one solution. Other solutions may be to set apart certain times for the main bridge and ferries to be used by returning vehicles, providing supplementary bridges, or widening bridges (such as the M4 bridge) to accommodate two lanes of traffic. The degree to which control is necessary is dictated by the volume of traffic going into the bridgehead and the number of returning vehicles.

Ambulances evacuating casualties are normally given a high priority among returning vehicles.

110. TRAFFIC EMERGENCIES

Despite thorough planning, emergency problems will arise during actual operations. Exceptionally strong or weak enemy resistance may require changes in priorities of armored units, class V supply, and gasoline vehicles, and will affect the volume of traffic crossing the bridges. Destruction of one or more bridges may require prompt rerouting of traffic and a raising of priority for engineer bridge units so they may come forward promptly. If bridges are damaged or destroyed, emergency staging areas should be used to take excess vehicles off roads until traffic can move faster. If individual vehicles or groups of vehicles get out of convoy because of poor convoy discipline or accidents, they must be pulled off the roads, reorganized, and sent forward in a controlled movement.

111. TRAFFIC SIGNAL COMMUNICATION

Continuous communication must be maintained between traffic control points and other traffic facilities so changes in routing, in priorities, or in other elements may be rapidly put into effect.

112. TRAFFIC CONTROL TROOPS

In addition to military police units, additional troops may be used to control traffic. Armored cavalry units are particularly adapted for this task because of their communication facilities. Liaison airplanes with qualified observers are excellent for locating trouble spots and assisting traffic control.

113. SELECTION OF ESSENTIAL VEHICLES

a. As early as possible in the planning phase, the division commander, on recommendations of subordinate unit commanders, designates the number and types of high-priority vehicles to cross the

stream. The vehicles cross by rafts or bridges as soon as these means are established. Vehicles normally high on the priority list include:

(1) Armored vehicles.

(2) Engineer equipment for far-bank tasks.

(3) Ammunition carriers.

(4) Heavy weapons carriers.

(5) Artillery forward observation vehicles.

(6) Medical vehicles.

(7) Antiaircraft vehicles for far bank.

(8) Artillery vehicles.

b. Other vehicles are held back, often in regimental groups, until after the essential vehicles have crossed the water obstacle. Although the tactical situation may require changes in the priority list, these changes should be held to a minimum since they may in the long run delay the passage of the force.

114. METHOD OF IDENTIFYING VEHICLE CARGOES

To assure that vehicles carrying engineer equipment are given the necessary priority on the roads, it is advisable to mark them with a special sign. Traffic-control vehicles may be assigned to convoy the columns of engineer equipment vehicles from parks to crossing sites and on the return trip, to prevent their being delayed. The subsequent suballotment of crossing equipment is facilitated if a list of contents is chalked on the sides of each vehicle carrying crossing equipment. The equipment is broken down into unit loads before the vehicles leave the parks.

Section IV. ESTABLISHMENT OF BRIDGEHEAD

115. GENERAL

Operations on the far bank must not stagnate. Bridgeheads must be extended sufficiently to allow assembly and maneuver space for the follow-up echelon or exploitation force, yet be secure defensively.

Defense positions must be strong enough to resist enemy attempts to interfere with the construction of the bridges and, later, with the crossing of the main body.

a. Defensive concept. The primary reason for establishing a bridgehead is to allow the attack to continue with the least possible delay. Objectives are consolidated and prepared for defensive action only to secure the bridgehead temporarily until the main body crosses the obstacle and resumes the attack. The ultimate defense then is the strong attack.

b. Maneuver space. The initial assault may be limited to frontal attack by fire and movement. As strong enemy resistance and possible counterattacks may be expected between our assaults upon the first and second objectives, it is essential to secure maneuver space in a bridgehead. Maneuver space in the bridgehead is vital to the continuation of the advance and is also necessary if exploitation, particularly by armor, is to be effective.

116. BUILD-UP ON FAR BANK

The rate of build-up on the far bank must exceed the enemy's capacity for concentrating against the bridgehead. Enemy counterattack capabilities must be carefully anticipated and the bridgehead made secure before such hostile counterattacks can be launched. Reorganization on the far bank and thereafter must be accomplished with a minimum of delay. The attack must keep moving; reserve troops must reinforce the assaulting troops to carry on the attack.

117. REINFORCEMENT OF THE ASSAULT FORCE

Once assault waves land on the far bank, steps must be taken to link them with supporting services and reinforcements. A ferry service for both troops and vehicles must be started at the earliest opportunity; amphibious vehicles may be the best medium for this task. Close-support weapons must be ready to cross immediately behind the assaulting

waves to increase the amount of fire power in the bridgehead by all possible means. Reserves must follow assault troops closely, and be prepared for commitment if the attack slows down under enemy counter-attacks, or if the flanks require protection. Local commanders must be prepared to reinforce initial success with all available reserves. Commanders of leading regiments must be in position to employ their reserve battalions to meet any changes in the tactical situation.

118. MOPPING UP

Mopping-up on the far bank of the river is an important task of the assault echelon, carried on concurrently with the advance. Failure to mop up may leave parties of the enemy unmolested where they not only can interrupt the crossing of further troops, but also interfere with the work of engineers at the raft and bridge sites. Such interference leads to delay in the whole build-up program and may jeopardize the success of the attack. To maintain the speed and the direction of the attack, specific units in the second and succeeding waves of the assault echelon are assigned zones to mop up. When relieved by reserve elements, they can move forward to reinforce the assault troops.

119. CROSSING RESERVE FORCES

Regimental and division commanders commit their reserves by units capable of decisive action rather than send them to engage the enemy piecemeal, as each unit arrives, even though troop arrivals on the far bank of the river may be in an unbroken stream. The crossing of the corps reserve should follow the crossing of the assaulting division's reserves to provide the necessary exploitation force.

120. PRIORITIES FOR ANTIAIRCRAFT GUNS

In the early phases of a river crossing, antiaircraft artillery protection is needed for concentrations of engineer equipment, for troop assembly areas, field artillery areas, and for critical points along

routes of communication. When the crossing actually starts, protection of the crossing sites against air attack normally has the highest priority. There is seldom enough antiaircraft artillery available to defend adequately all installations within a given area from air attack. To employ effectively the antiaircraft artillery, the commander must establish a priority list, based on the amount of antiaircraft artillery available, the vulnerability of each element to air attack, and the importance of the element to the ultimate accomplishment of the mission. Each element is defended in accordance with its position on the priority list. Recommendation of establishment of an inner artillery zone, or a gun-defended area at the bridgehead, should also be considered. See FM's 44-4, 44-8.

Section V. DEVELOPMENT OF CROSSING MEANS

121. GENERAL

a. The development of the crossing means may be divided into five steps:

(1) Assault boat crossing
(2) Construction of footbridges.
(3) Construction of rafts and their approaches.
(4) Construction of light vehicular bridges and their approaches.
(5) Construction of heavy bridges and their approaches.

b. Description, use, and allotment of crossing equipment are given in chapter 3, along with factors to be considered in ordering heavy-bridge construction.

c. The rest of this section discusses various technical aspects of bridge and raft construction.

122. SPECIAL CONSIDERATIONS

Planning must consider any special equipment requirements as well as the use of any local means for the crossing. Civilian boats, loading docks, and local items of equipment may play a large part in the operation. Naval craft or amphibious vehicles, if available, should be used in the crossing operation to the maximum practical extent for ferrying troops, supplies and equipment.

123. RAFTS

a. Capabilities and limitations. Rafts are an excellent means of putting the high-priority essential vehicles into the bridgehead during the interval between the assault crossing and the completion of bridges. Employing men and equipment on raft construction and use, however, may retard the building of bridges. It takes almost as long to build a raft and put it in operation as it does to build a bridge to span a stream which is 150 feet or less in width. Because rafts are likely to furnish the only available means for carrying across the essential vehicles, they almost always have to be employed in the second phase of a major crossing operation, particularly on the wider water obstacles. In later phases, certain raft sites may have to be kept in use to return vehicles; to carry civilians, displaced persons, and prisoners of war; to evacuate casualties; and to supplement bridge traffic. Rafts are an important means of crossing in case of floods or floating ice or during major bridge repairs. For advantages and disadvantages of rafts, see paragraph 32.

b. Construction and operation logistics. For details on the logistics of transportation, construction, operation, and capabilities of standard rafts, see table II.

124. BRIDGES

Bridges are constructed after the second objective is taken or earlier if enemy artillery fire is ineffective. The tactical factors influencing the commander's decision to erect bridges are: first, that small-arms and effective artillery fire is eliminated before construction begins; and second, that the assault troops on the far bank are reinforced as soon as possible.

a. General. The construction of bridges is greatly affected by the construction of their approaches. Engineers are usually confronted with the problem of either erecting new military bridges or repairing damaged permanent bridges. Should it be decided to erect a new bridge, it is frequently easier to use the site of the demolished bridge, or a site immediately adjacent to it, than to start building at some entirely new place. Full advantage can thus be taken of the existing road approaches. It is a disadvantage that such sites are obvious to the enemy. They almost certainly have been registered by hostile artillery and their approaches mined and cratered. As any one of these deterrents considerably increases the time of bridge construction, they may make it unwise to use an existing bridge site. The growing demand for crossing more and heavier vehicles over the obstacle during early phases of the attack may confine bridge construction to sites already served by good roads. Details as to the logistics of transportation, construction, operation, capacities, and limitations of bridges are given in table III.

b. Requirements for bridges. The minimum bridging requirements are usually computed to be one heavy bridge and one lighter bridge for each assaulting division, later augmented by two or more heavy bridges to take the corps line-of-communication traffic.

c. Construction of approaches. When a bridge is built at other than an existing site, the construction of its approaches is normally a longer and more difficult task than the erection of the bridge

itself. Until a detailed examination of the approaches has been made, it is not possible to make more than an approximate estimate of the time required to complete a bridge. It usually is best to build all the heavier bridges on or adjacent to the sites of the demolished main-road bridges, so existing approaches can be used to the fullest extent. Later in the operation the demolished bridges on the main axes may be cleared and semipermanent bridges constructed on their sites alongside the tactical bridges, which can then be dismantled.

d. Maintenance of bridges and approaches. Normal wear and tear necessitates constant maintenance of all bridges and their approaches. Local reserves of equipment and the necessary working parties should be kept available. As it is often necessary to close certain bridges for temporary maintenance, the corps traffic plan must allow for traffic diversions. When the routes forward over the heavy bridges can carry enough traffic to keep the lines of commmication open, need for the supplementary routes over the light bridges ceases. Orders should include statement of the date when it is anticipated these routes may be closed and the bridges dismantled. Subsequent arrangements must be made to recover this equipment for use elsewhere.

e. Bridge protective devices. Bridge sites need local defenses against air attack, counterattack by land and airborne forces, and sabotage. They must also be defended against enemy attempts to destroy bridges by floating mines, swimmer demolition parties, small submarines, and fast motor launches. To guard against such attacks, the engineers must construct booms and nets above and below bridges. Protective devices must be covered by fire, by searchlights, and by troops posted along the banks to watch for and destroy mines, craft, and demolition parties as they approach the bridge.

f. Effect of floating ice and floods. Ice has a disastrous effect on floating bridges unless the flow of ice under the bridge is carefully controlled. Blocks of ice may be passed under and between

the float supports if the blocks are broken up into small chunks and pushed under the bridge. Ice jams should be blown by explosives, upstream from the bridge. Construction of floating bridges when ice is "running" on a river is difficult and should be avoided. Floods also present problems to the maintenance of floating bridges, particularly to bridge approaches and abutments. Alternate bridge sites with approaches and abutments on higher ground are necessary for use during seasons of flood. Since rafts provide an alternate means for crossing during floods, raft sites should be planned for use under such conditions.

125. RESPONSIBILITY FOR STARTING RAFT AND BRIDGE CONSTRUCTION
The construction of rafts and bridges must start as soon as practicable. Footbridges, infantry support bridges, and rafts are usually constructed on the division commander's orders (par 18c). Heavy-bridge construction is begun on order of the corps or division commander, depending on the extent to which control of bridging has been decentralized.

126. PROBLEMS ARISING WHEN EXTRA ENGINEER TROOPS ARE USED
The engineer component of an infantry division is sufficient to support the river-crossing needs of the division only for hasty or small-scale operations. Large-scale operations require division engineer troops to be reinforced. Under these conditions, special problems may arise between the division, corps, and army engineer troops about relationship and control.

a. Division engineers in tasks requiring closest cooperation with division troops. Division engineer troops should be employed on tasks requiring close cooperation with the rest of the division, while corps and army engineers should be responsible for construction and operation of facilities along the main axes of communications. The

employment of the division engineer troops in the actual crossing depends greatly on the amount of engineer support necessary on the far bank.

b. Release of division engineers from crossing duties. If the engineer plan provides for the use of division engineers on the river in the assault-crossing phase, they must be relieved of their river-crossing tasks in time so they can help their division fight the battle on the far bank. Some division engineer troops must be included in the assault echelon to provide engineer support to the assaulting troops until the bulk of the division engineers can reinforce them.

c. Coordination between division and corps troops. Although the corps engineer is normally responsible for overall engineer control of the crossing (less division elements), he delegates authority to subordinate commanders. Depending upon the particular circumstances of the operation, he delegates responsibilities either on a sector basis or on the basis of crossing sites. Once the employment of the division engineer troops has been determined, corps engineer missions can be assigned. Only through close cooperation and coordination between corps and division engineers can the support necessary to cross the division successfully be obtained.

Section VI. CROSSING EXPLOITATION FORCE

127. GENERAL

Once the bridges are completed, the crossing of the exploitation force can start. When the situation is favorable for a deep thrust against the enemy, as after a hasty crossing, it is usual to pass a striking force from the corps main body over the water obstacle ahead of the administrative units of the assaulting division.

128. CONSIDERATIONS OF EXPLOITATION OF BRIDGEHEAD

Portions of division plans need to be shaped to a large extent according to the way the higher commands intend to exploit the crossing and continue the advance, once bridgeheads have been gained. Both corps and army must therefore, in the early stages of long-range advance planning, outline tentative plans for the use of exploitation forces. Corps must formulate detailed plans for the use of their reserve divisions, particularly their armored divisions, as exploitation forces, and inform each division of the time when these exploitation forces will be crossed.

129. CONTROL MEASURES

All reserve and reinforcing elements of the corps main body remain under centralized control in concentration areas until ordered by corps to cross. At this stage of the operation, staging areas probably become superfluous as such, and serials move directly from their concentration areas over the obstacle. Parking space near the routes should, however, be retained in case a hold-up in flow of traffic is caused by damage to any of the bridges.

130. LIAISON WITH ASSAULT UNITS

The exploitation force maintains close liaison with the assaulting units. Only through liaison can the exploiting force rapidly receive and use to advantage accurate information about covered routes of approach, limiting points, phase lines, routes of communication, and enemy capabilities and disposition.

131. ALTERNATE PLANS

The actual employment of the exploitation force may depend on the disclosure by the assaulting troops of soft spots in the enemy defenses. Plans for the employment of the exploitation force are therefore made as flexible as possible with alternate plans ready for use at several of the most likely positions.

132. UNIT SERIALS

a. Vehicles and troops that will cross the bridges are grouped into unit serials in the order in which they are required on the far side of the river. It is sometimes convenient to divide the serials into two columns: one column which is to cross by light bridges, and a second which is to cross by heavy bridges. Tactical unity is maintained as far as practicable in grouping vehicles into unit serials. A provisional allotment of serials with their timings should be made for each bridge.

b. Under certain conditions, varying with time of day, the weather, degree of air superiority, and strength of the antiaircraft defenses, serials traveling at a normal density become a target to air attack. Therefore, every effort must be made to get traffic across the bridge as fast as possible. The possibility of a complete stoppage at the approaches to the bridges must be balanced against the need for a quick crossing by individual serials.

c. When the crossing plan provides for two or more bridges, the allocation of a combined priority for all serials capable of crossing these bridges assures that the overall order of movement across the remaining bridge or bridges is clear if one of the bridges is damaged or destroyed (fig 21).

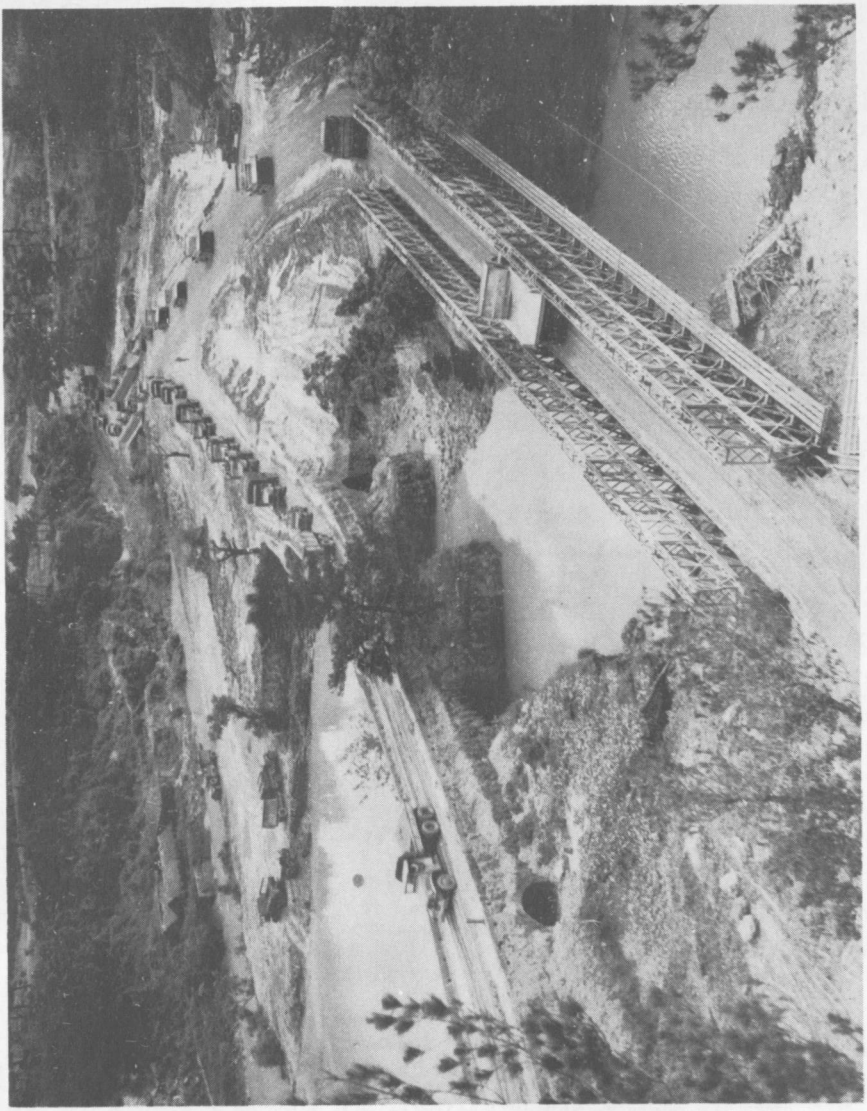

Figure 21. These bridges over water obstacles provide alternate routes and increase maximum traffic flow.

Chapter 7

EXECUTION

133. GENERAL

This chapter is concerned primarily with the operational aspects of a river-crossing operation. It covers the advance to the river, assembly and preparation for crossing, the assault, and the advance on the far bank.

134. ADVANCE TO THE RIVER

During the advance to the river, the commander groups his forces in readiness for the crossing. He makes every effort to approach the river on a broad front despite limited main routes of communication and terrain difficulties which impede deployment of advancing troops. Enemy strong points that have to be bypassed in the initial stages of the advance, such as forts on the near side of the river, are neutralized or reduced before the crossing is attempted. Mine fields and other obstacles are breached during the advance. The road net in the vicinity of the river line is used as little as possible consistent with security requirements.

a. Speed. Speed is important during this phase of the operation. If the enemy is retreating, a speedy advance may catch him astride the river where he can be destroyed.

b. Seizing bridges intact. Bridges that are seized intact and those that have been only partly demolished may change a costly deliberate crossing into a hasty crossing which can immediately be exploited. As soon as warning orders are received, task forces should push through with all possible speed to capture the bridges intact or to hurry the enemy so bridge demolition cannot be completed. Partly demolished bridges may be quickly spanned by sections of fixed or portable fixed bridging (fig 22).

Figure 22. A partly demolished bridge is made usable by the use of treadway sections.

135. ASSEMBLY AND PREPARATION FOR CROSSING

a. General. Intelligence, reconnaissance, and planning are completed while the expedition is advancing to the river. Concurrently, assembly of troops and equipment is begun in preparation for the crossing.

b. Assembly of troops. Normally, all troops and their accompanying vehicles assemble in the concentration areas and move forward, when ordered, through the assembly areas to the river. Except for units detailed to support the assault from positions forward of the assembly areas, and reconnaissance parties, there should be no deviations from this. All units should be moved into the concentration areas in accordance with their mission in the crossing operation regardless of their previous functions during the advance to the river.

c. Assembly of crossing equipment. The bridging and assault-crossing equipment is assembled in engineer equipment parks so it can be checked, repaired, and if necessary broken down into loads and reloaded. Engineer troops who are to erect or man the equipment are assembled concurrently.

d. Assembly of essential vehicles. The essential vehicles selected for the assault are assembled, loaded, and checked to assure that they are technically and mechanically conditioned to perform as planned for the operation. If the vehicles are to be waterproofed or specially prepared or equipped for the crossing, special arrangements are made in advance. The weight classification of each vehicle determines the type of bridge or raft over which that vehicle can be routed. Unit commanders must see that the authorized loading of vehicles is not exceeded.

136. THE ASSAULT

a. General. The assault starts when infantry leaves its attack positions and ends when a bridgehead large enough to permit the construction of bridges is established. The attainment of the third objective ordinarily completes the assault.

b. Sequence of crossing in assault boats. (1) Boats are unloaded by the engineer crews and located either in the attack position or at an intermediate boat area between the attack position and the river. Engineer guides from the engineer assault boat teams meet infantry units as they enter the attack positions and guide them to their respective boats. Assault boats are hand-carried by the infantry-engineer teams to the river. The boat-carry should be as short as possible consistent with cover and concealment, security, and surprise. At the designated time, the first assault wave moves forward to cross the line of departure or put its boats on the river at H-hour.

(2) A crossing control officer is assigned to supervise the embarkation of the assault waves and the follow-up force at each crossing place. A landing officer is similarly assigned to control on the far bank.

(3) Assault boats promptly return to the near bank when each trip is completed, to pick up subsequent waves.

(4) A boat ferry service is established at several sites along the crossing front as promptly as possible. Assault boats and crews are provided for all troops crossing the initial waves. Assault boats for the crossing of succeeding waves must start as soon as they are loaded. Boats leave from the same near-bank crossing area and proceed to the same far-bank area on each trip. Succeeding waves are ordered to the near bank by the crossing control officer in time to embark as the boats return.

c. Infantry-engineer cooperation in assault. Close cooperation is essential between infantry and engineers in the assault. In the initial assembly areas engineer commanders confer with infantry commanders to assure that routes, order of march, and entrances into the attack position are clearly understood. Engineer guides lead the infantry boat teams by previously selected routes with a minimum of delay to the correct locations. Infantry boat teams follow the orders of the engineer boat commander during the carry to the bank, embarkation, crossing, and debarkation.

d. Special parties accompanying assaulting troops. The special parties accompanying assaulting troops join their infantry boat teams in the attack positions before the teams move forward with the boats or sooner if possible. The parties and equipment that accompany assaulting troops are carefully provided for in the loading of assault boats. These parties and their missions include:

(1) Aid men. Organic aid men always accompany assault troops to care for and evacuate the wounded.

(2) Artillery forward-observation parties. A forward-observation party from the artillery accompanies each assaulting company. It must be able to carry its own radios and equipment.

(3) Fortification assault teams. If fortified positions exist on the far bank, infantry flame-thrower-demolition or other assault teams may accompany the assaulting troops to reduce the obstacle.

(4) Liaison parties. Liaison parties of the supporting assault troops, the follow-up force, and the exploitation force may accompany the assaulting troops.

e. Clearing mines and obstacles. Mines and obstacles on the near bank, under water, and on the far bank are removed by clearing or demolition just before the assault. Where deception is paramount, the underwater obstacles and far-bank mines and obstacles may have to be removed by special teams accompanying assault troops. As engineer resources are greatly extended during early phases of the operation, specially trained infantry teams may have to undertake the breaching of minor obstacles, particularly those encountered unexpectedly on the far bank.

f. Tactical action of assault troops after crossing. (1) When the far bank is reached, boat teams disembark promptly and move forward rapidly in the attack or to a rallying point where units quickly re-form and advance to their objective. If the assault is supported by an artillery barrage, this barrage continues for a time along a line covering the leading companies in their attack or re-forming at the rallying points. Flank protection and liaison with adjacent units is established without delay.

(2) When the barrage starts to move forward again, these companies follow close behind it, even though, through some unforeseen delay in the crossing, they may not have completely re-formed. Special subunits are detailed to mop up enemy positions rapidly and thoroughly so this task can be done without delay.

(3) Strict attention is paid to the problem of keeping direction during the assault. Full use is made of navigational aids, such as compasses, prominent landmarks, colored shells, and tracer ammunition. Troops are detailed to widen the bridgehead by working to the flanks from points where success has been gained. Additional crossing places are established when suitable sites have been secured. The enemy may prove to be holding in strength the site most suitable for the main bridge; if so, it is probably prudent to launch the assault at a place where resistance is not likely to be so strong and then, after a bridgehead has been gained, to attack along the far bank to secure that site.

g. Antitank defense. The enemy will attempt to destroy the bridgeheads as early as possible, usually by armored thrusts aimed at the crossing points and bridge sites. All concerned must be alert for the difficulties and delays usually experienced in getting heavy mobile antitank guns across the river, and must be prepared to take part in aggressive antitank operations with their hand-carried weapons from the moment they secure a foothold on the far bank.

137. ADVANCE ON FAR BANK

The advance on the far bank continues forward of the assigned river-crossing objectives when the tactical situation and logistical build-up indicate that further advance is in order and can be adequately supported.

Chapter 8

MISCELLANEOUS

Section I. USE OF AIRBORNE TROOPS

138. GENERAL

This section discusses the use of airborne troops in a river-crossing operation. The next section covers the crossing of very wide or heavily defended rivers. The third section discusses special problems; the last section, future trends.

139. SPECIAL CONSIDERATION

Airborne troops may be used for deliberate river-crossing operations. They are very rarely used in a hasty river crossing because of the time required for planning and coordination, and because airborne troops are normally theater reserve units. In a deliberate crossing operation over a very wide or heavily defended river the use of airborne troops in the initial phases of the operation is advantageous in securing the bridgehead. See FM 71-30 for tactics and techniques of airborne units.

140. MISSIONS

Airborne troops may be given the following missions in a river-crossing operation:

a. To seize a bridge intact ahead of advancing ground units.

b. To establish an initial bridgehead on the far bank to be expanded and exploited by water-borne troops.

c. To intercept enemy mobile reserves attempting to reinforce the enemy troops defending the river line.

d. To attack strong points in the enemy river defenses.

e. To immobilize enemy reserves by staging a feint or ruse in the form of extensive airborne preparations in the vicinity of the crossing sites.

141. EXPEDIENT AIRBORNE OPERATIONS

It may be possible to use, for minor airborne operations, the aircraft available in a field army. Infantrymen may be transported to the far bank of a river in liaison planes. The use of liaison planes in ferrying troops and supplies across a river is ordinarily limited to the later phases of the operation. Helicopters may be used to transport supplies across the water.

142. AIR EVACUATION

Evacuation of casualties by air from the far bank is a rapid means of bringing them directly to adequate medical facilities. It eliminates the slow handling and rehandling of casualties by far-bank, river-crossing, and near-bank means. Also, it cuts down the volume of return traffic on vital bridges. Planes flying into the bridgehead to pick up casualties are first loaded with supplies for the far-bank troops. Plans for crossing a river should include the capture, if possible, or the construction of a landing strip large enough for cargo planes.

143. SUPPLY

When planes can land in the bridge head, critical supplies can be flown in. Dropping supplies by parachute is, at best, an inefficient supply means because bundles scatter, and there is a lack of personnel and vehicles to collect, sort, and distribute such supplies. However, it may be the only sufficiently fast means of resupplying the assaulting troops with ammunition, particularly in the early phases of the operation.

Section II. CROSSING VERY WIDE OR HEAVILY DEFENDED RIVERS

144. VERY WIDE RIVERS

Very wide rivers present specialized crossing problems that are ordinarily solved at theater level. Such crossing operations take a pattern similar to shore-to-shore amphibious operations and differ from ordinary crossings in that greater emphasis is given to special equipment, training, and large-scale rehearsals.

a. Use of barges. In addition to the crossing means given in chapter 3, barges may prove invaluable in crossing very wide rivers. Every attempt should be made to locate them and move them to bridge sites. They may be weighted down and used as piers for either floating or fixed bridges. They may be kept floating, securely anchored, and used with expedient floating bridges in place of or in addition to standard bridges. When barges are provided with a source of power, they also may be used to ferry supplies, equipment, troops, and vehicles across the river.

b. Use of navigation equipment. When very wide rivers are crossed under cover of darkness, pathfinders may be sent across the river just before the assault crossing, to use infrared lights or other means to signal the assaulting troops and guide them to their intended landing areas.

145. TWO OR MORE RIVERS

a. Where two or more rivers closely parallel each other and are not over 10 miles apart, it may be possible to force a hasty crossing of the first river encountered and then, without waiting to consolidate, push on with all possible speed to the second river, to seize its bridges intact and to make a second hasty crossing. When this is accomplished, reserve troops are placed as soon as possible in the first river bridgehead to protect the flanks of the troops assaulting the second river. As in the case of all hasty crossings, operations are conducted with utmost speed.

b. If the situation demands a deliberate crossing of the first river, elements of the assault troops and the follow-up force are assigned to the specific mission of pushing forward to the second river to seize its bridges intact or to force a hasty crossing. This plan of action is timed to take advantage of the need by the enemy to provide crossing means for their troops engaged in the retrograde action. The enemy defensive system of the successive river lines may be so well-organized that only by a series of deliberate crossing operations can the last river barrier be surmounted. In this case the bridgeheads of the first river are secured and consolidated after each crossing, and the necessary equipment moved up before the second river is assaulted.

c. Long-range advance planning and detailed planning must be provided for crossing each river in the system. The necessary troops, equipment, and supplies for crossing all water obstacles must be assembled and made ready before crossing the first river.

146. HEAVILY DEFENDED RIVERS

a. Rivers are often used as a major obstacle in a permanent deliberate defensive system. The assault of heavily defended rivers therefore presents a special problem in river-crossing operations, because very extensive massing of artillery and air bombardment is needed to gain and maintain the support-fire superiority necessary to force such a crossing. Heavy artillery and tactical air force attacks are made against enemy fortified defensive positions far in advance of the crossing operation. Artillery fire and air strikes continuously cover the enemy defensive areas during our advance to the river line.

b. Even though the assault troops cross successfully, it may be impossible to construct bridges because of concentrated enemy artillery fire along the crossing front. In this case, assault troops on the far bank must be supplied and reinforced by assault-boat ferry services and rafts operating under cover of smoke and darkness. Enough

troops must be immediately moved into the bridgehead to assault the fortified positions and to eliminate the observation posts of the enemy artillery. Weak points in the enemy defensive system may be used as initial crossing sites regardless of routes of communication. Then assault troops who thus gain a foothold on the far bank attack adjacent strong points located on communication lines, and secure the necessary bridge sites. The initial crossing against a heavily defended zone is along a broad front, but extended depth in the assaulting force must be maintained to enable the assault commanders to commit fresh reserves against enemy strong points. The assault crossing of a heavily defended river may be made as a silent night crossing to gain surprise long enough to secure a foothold on the far bank or to overwhelm its defenders.

Section III. SPECIAL CONDITIONS

147. WINTER CONDITIONS

a. The problem of ice complicates stream crossings under winter conditions. Assault boats are vulnerable to floating ice and may be damaged if forced through ice layers. Normal floating bridges can be used but special protective measures must be taken to prevent damage to their floats. (See FM 31-70.)

b. Ice bridges can be used under certain conditions such as crossing open channels having a slow-moving current, if the ice is thick enough or can be strengthened to support the desired load. If the ice is weak or there is open water, standard floating bridges are used. Special precautions are necessary near the edge of ice and open water, and the floating bridges must be removed before the spring breakup.

c. Rivers which remain frozen for long periods may be crossed with little difficulty. The ice layer may be reinforced for use by heavy vehicles by adding timber treads or other load distributing devices.

d. Keeping troops warm and dry while they are crossing the water or working on equipment in the water in winter is a problem that merits attention.

148. SWAMPS

Swamps present particular problems to an attacking force. Wheeled vehicles, tanks, and heavy equipment are limited in most cases to the main routes of communication. Standard bridges are used to close the gaps in the vital main lines of communication. As in the case of defiles, the speed of the advance over the restricted number of routes through the swamp must if possible be increased while remaining consistent with the advance of the troops moving through swamps parallel to the lines of communication. The feasibility of bypassing swamp areas must be considered beforehand and extended operations in swamps should be avoided if possible.

Section IV. FUTURE TRENDS

150. GENERAL

In the future there may be changes in the concept of a river-crossing operation; there undoubtedly will be many changes in equipment. Changes that may be anticipated are summarized below.

151. ANTICIPATED CHANGES

a. The trend toward air transport may lead to crossing rivers through the air rather than on their surfaces.

b. The increased range and mobility of artillery will tend to change our concepts of objectives.

c. The development of new types of amphibious vehicles may decrease the present requirements for river-crossing means.

d. The crossing of personnel, supplies, and even vehicles by aerial ferry (lighter-than-air aircraft or helicopters) will aid materially in reinforcing the initial assault units.

e. Rocket-propelled supply packets may be used for supplying the bridgehead.

f. Radioactive fission products may be used to contaminate the river and its banks; these enhance the value of the river as an obstacle.

g. Vehicles with improved cross-country mobility and low ground bearing pressures may reduce greatly our present dependence on good road nets.

Appendix

REFERENCES

FM 7-24, Communication in the Infantry Division.

FM 17-70, Signal Communications for Armored Units.

FM 31-70, Arctic Operations.

FM 44-4, Employment of Antiaircraft Artillery Guns.

FM 44-8, Antiaircraft Operations Room and Antiaircraft Intelligence Service.

FM 71-30, Employment of Airborne Forces.

FM 100-5, Field Service Regulations, Operations.

TM 5-277, Panel Bridge, Bailey Type, M2.

INDEX